UPPER AND LOWER MANN LAKES
AREA STRUCTURE PLAN

BACKGROUND STUDY
1989

Prepared for:
County of St. Paul

Prepared by:
Planning Branch
Alberta Municipal Affairs

62-335

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1.0 INTRODUCTION

1.0 INTRODUCTION

The northeastern region of Alberta contains numerous lakes with high recreational and tourism potential. According to a regional tourism study, these lakes should be prepared to accommodate "a broad tourism market that ranges from unstructured outdoor recreationists to retirement second home owners". (Marshall, Macklin, Monaghan. Regional Tourism Development Alternatives, 1979.) It is anticipated that as the demand for water based recreation increases, this region will be identified as a new tourism destination point.

Upper and Lower Mann Lakes are included within this region and have been a major local and regional focal point for recreational and residential development. Because of their central location, accessibility from Highway 28 and overall natural beauty, Mann Lakes could become one of the heaviest developed lakes in the area.

However, overdevelopment, inappropriate allocation of the natural resources and alteration to the natural environment could result in significant changes that could reduce or destroy the recreation potential of the Mann lakes. What was initially regarded as an excellent destination for a weekend vacation or cottage location could come to be seen as much less attractive. Further, lower than average precipitation and spring run-off levels and an overall decline in regional ground water levels in recent years have created a perceived deterioration of the natural lake environment. Increased shoreline aquatic vegetation, summer algal blooms deteriorating water quality and poor fishing have resulted in increased resident complaints to the County of St. Paul.

Currently, the County lacks definite municipal policies to guide lake use and development. Recognizing that any reduction in the quality of the natural environment threatens the long term enjoyment of the lakes and their potential for future recreational and residential use, the County requested the Planning Branch, Alberta Municipal Affairs to assist them in the preparation of an area structure plan for Upper and Lower Mann Lakes.

1.1 Planning Process

The first step in the area structure plan process involves the preparation of a background study containing a comprehensive inventory and assessment of the geophysical and biophysical resource base of each lake. The study will also identify existing land uses and land owner perceptions of lake use. The second step involves the preparation of the actual area structure plan which outlines the lake planning strategy including specific municipal policies and land use guidelines. Both steps will be reviewed by the Council of the County of St. Paul and includes provisions for public workshops and hearings. After the reviews and hearings, Council will adopt the area structure plan as a legal planning document in accordance with Section 64 of the Planning Act, R.S.A. 1980.

1.2 Purpose

The purpose of the Background Study is to identify the development limitations of the lakes and provide an assessment of the environmental, social and land use capabilities. The Study will undertake the following:

a) a detailed inventory of the physical, biological and social characteristics of the lakes, and

b) an evaluation and assessment of each characteristic to identify development limitations and capabilities.

The result will be the identification of lake development problems and recommendations for future land use.

1.3 The Planning Area (Map 1)

The planning area includes both Upper and Lower Mann Lakes, their islands, shorelines and immediate hinterland extending approximately 1.5 km back from the high water level of each lake. This boundary also encompasses Greenstreet Lake, Whiskey Jack Lake, a portion of Chappel Lake and the Hamlets of Ashmont and Bayview Beach. Ashmont will not be included in any part of this study. Bayview Beach is included and will be evaluated as part of the overall lake environment. Both lakes lie within the administrative boundaries of the County of St. Paul No.19.

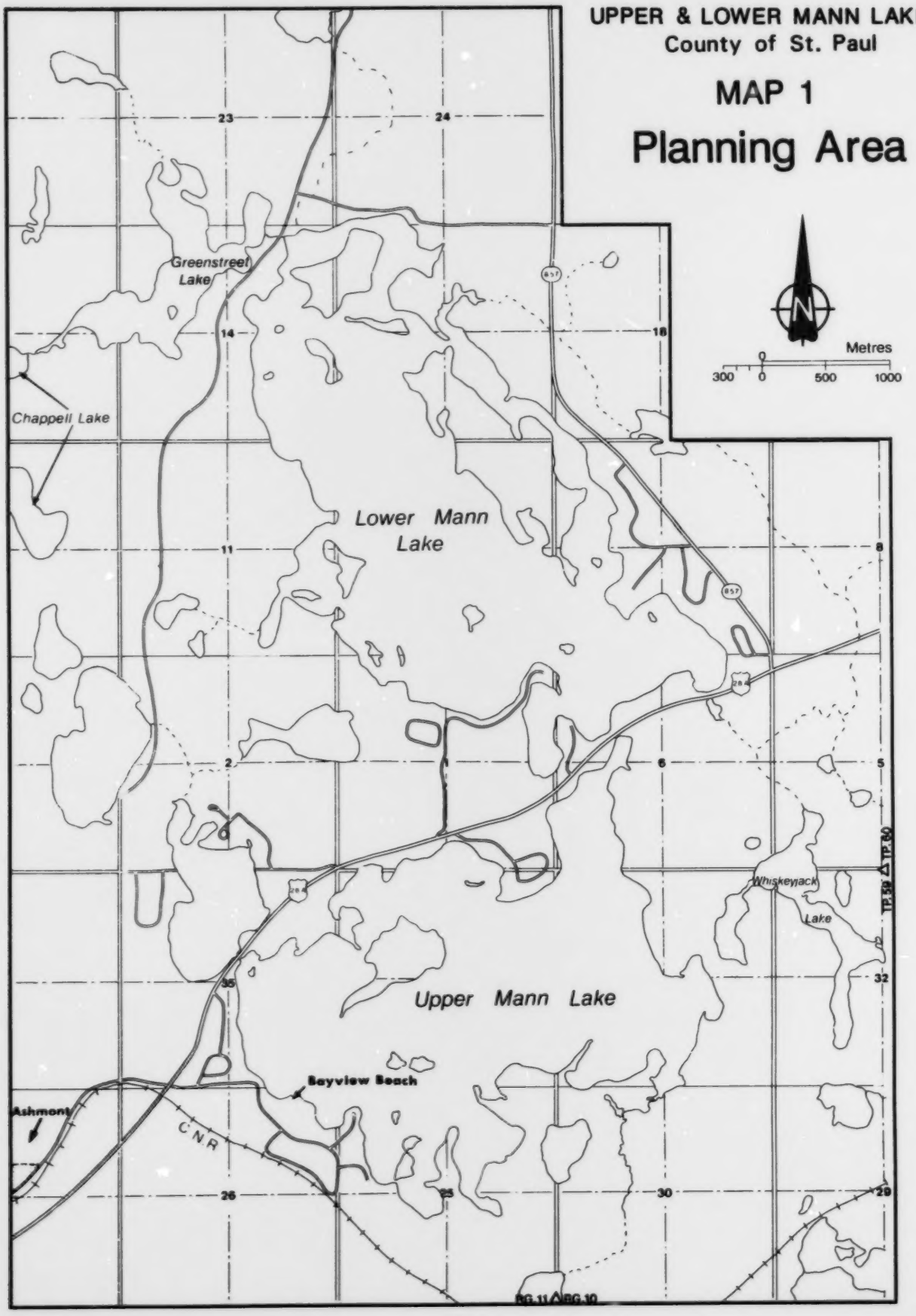
1.4 Regional Setting (Map 2)

The Mann Lakes are located approximately 200 km northeast of the City of Edmonton and 36 km northwest of the Town of St. Paul. Highway 28A from Edmonton to Cold Lake passes directly between the two lakes. There are two hamlets within the planning area; the Hamlet of Ashmont and the recently created Hamlet of Bayview Beach. Ashmont (population 350) contains an elementary school, commercial and retail services, public facilities and is serviced with a municipal water and sewer system. The hamlet water supply is obtained from Upper Mann Lake. The Hamlet of Bayview Beach contains only residential buildings.

The Mann Lakes are heavily utilized in both winter and summer. Highway 28 provides easy accessibility year round. Currently there are 485 registered residential lots on both lakes with approximately 40% developed for seasonal or permanent use. In the summer the lakes are used for fishing, boating and swimming and in the winter for ice fishing and cross country skiing. There is a Provincial Recreation Area located on the south shore of Lower Mann which offers day use areas, public beach and boat launching facilities and overnight camping and trailer sites. The County of St. Paul has developed a municipal reserve along the northwestern shore of Upper Mann Lakes that includes boat launching and parking facilities. There are no private campgrounds or commercial facilities outside Ashmont.

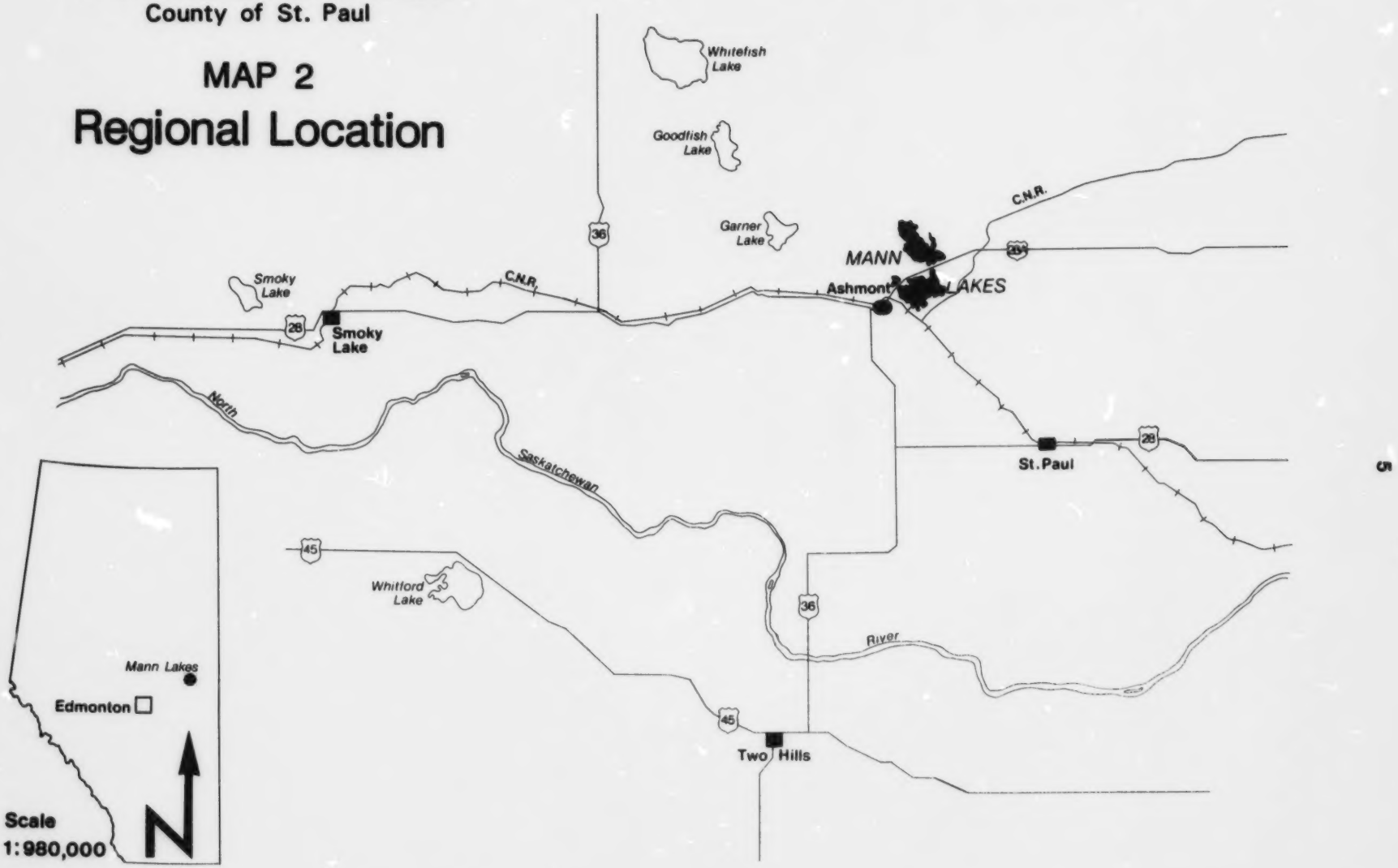
1.5 References

A majority of the geophysical information utilized in the inventory was obtained through field analysis and discussions with other government agencies. The biophysical data on water quality, aquatic vegetation and groundwater was obtained by Alberta Environment. Habitat assessment was provided by the regional offices of Alberta Forestry Lands and Wildlife. All of the physical and biophysical data in this report is general in nature and not intended for individual site evaluation. The survey results were obtained from a questionnaire mailed to all property owners within the planning area. The balance of information came from a literature review, government insights and interviews with local land owners and municipal officials. A complete list of publications, reports and personal interviews is provided in Appendix D. Research was undertaken between July 1988 and April 1989.


UPPER & LOWER MANN LAKES
County of St. Paul
MAP 1
Planning Area
N
Metres
300 0 500 1000
Greenstreet Lake
Chappell Lake
Lower Mann Lake
Upper Mann Lake
Whiskeyjack Lake
Bayview Beach
Ashmont
CNR
TP.59
TP.50
RG.11
RG.10
23
24
14
18
11
8
2
1
6
5
35
32
26
25
30
29

UPPER & LOWER MANN LAKES
County of St. Paul

MAP 2
Regional Location



2.0 GEOPHYSICAL RESOURCES

2.0 GEOPHYSICAL RESOURCES

2.1 Climate

The Mann Lakes are located within the continental climate zone, characterized by warm summers and cold winters. The mean annual precipitation is between 38-51 cm of which 73% falls as rain. The mean temperatures for July are 16° to 17° C and for January -18° to -20° C. The average frost free period is approximately 115 days with an average growing season between 155-160 days. (Kocaoglu, Soil Survey, 1975.)

Data on the Mann Lakes indicates that freeze up occurs during the third week of November, with the lakes generally being ice free by the second week of May. (County of St. Paul, Field Survey, 1989.)

2.2 Vegetation

The planning area falls within the mixed woods section of the Boreal Forest Region and represents the transition zone from parkland to the south and true Boreal Forest to the north. The dominant tree species is trembling aspen with varying mixtures of balsam poplar white spruce, birch, alder and willow. Black spruce and tamarack are found in the depressions or poorly drained areas, generally in association with a varying thickness of water-logged peat.

The understory is composed of an abundance of red choke-cherry, saskatoon, wild raspberries and blueberries.

Throughout the planning area, a thick forest cover predominates. Agricultural clearing accounts for only 35% of the total land area with residential clearing occuring along the developed shoreline.

2.3 Topography (Map 3)

The relief and landforms of the planning area probably resulted from debris-laden glaciers wasting in-situ. Large areas of glacial deposits (moraine) are abundant throughout this region. The resultant topography is generally rough with high local areas dominated by hummocky moraine (large till knobs and ridges). Hummocky moraine is generally characterized by well-drained moderate (9%) to strongly rolling (30%) hills interspersed with poorly drained depressionals found in ground water dispersal areas.

The approximate elevation of the Mann Lakes is 610 meters above sea level with the difference between the highest and lowest points points of land being 38m. The highest point is 650m located along the eastern and western fringes of the planning area.

The majority of the shorelands is characterized by sharp, steep slopes (9-30%) particularly along the eastern shoreline. Slopes to the west are characterized by moderate to gently sloping beach areas (5-9%). (Kocaoglu, Soil Survey, 1975).

2.4 Soils

The planning area is dominated by a single soil group, Orthic Grey Luvisols, which form the soil series, Athabasca and La Corey.

The Athabasca soil series dominates the hummocky morainal plain of the planning area. These Orthic Grey Luvisols consist of a fine loam, weakly calcareous, and moderately well-drained, glacial till. The LaCorey soil series predominate to the west. These Orthic Grey Luvisols consist of a fine loam, moderately calcareous and well-drained glacial till, (Table 1).

TABLE 1

SOIL PROPERTIES

Soil Series	Soil Groups	Soil Type	Parent Material	Drainage	Topography
Athabasca	Orthic Grey Luvisols	Loam	Fine-loamy, weakly calcereous glacial till	moderately well drained	moderate to strongly rolling
La Corey	Orthic Grey Luvisols	Loam	Fine-loamy, moderate to strongly calcereous glacial till	moderately well drained	undulating to strongly rolling

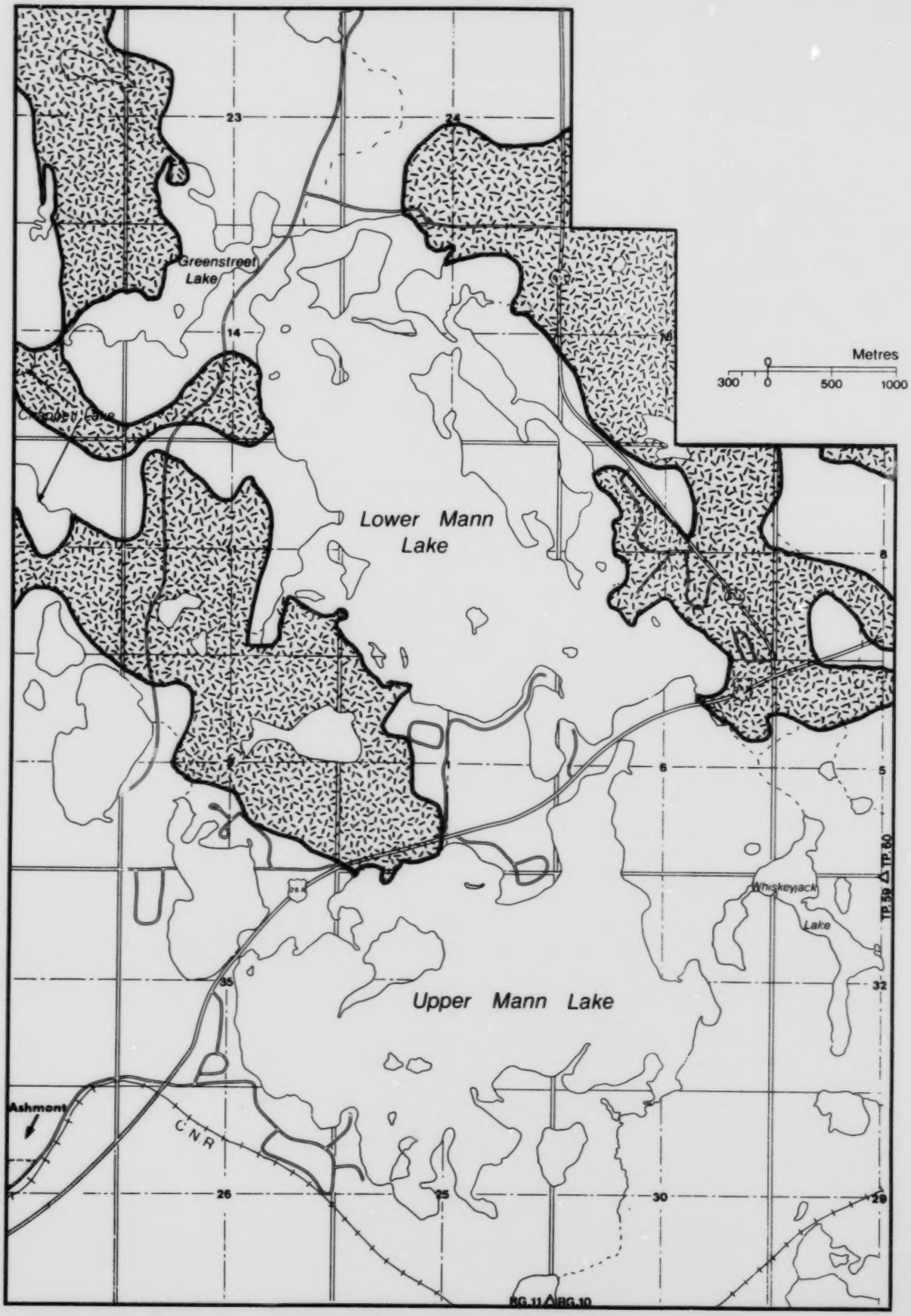
(Kocaoglu, Soil Survey of the Sand River Area, 1975)

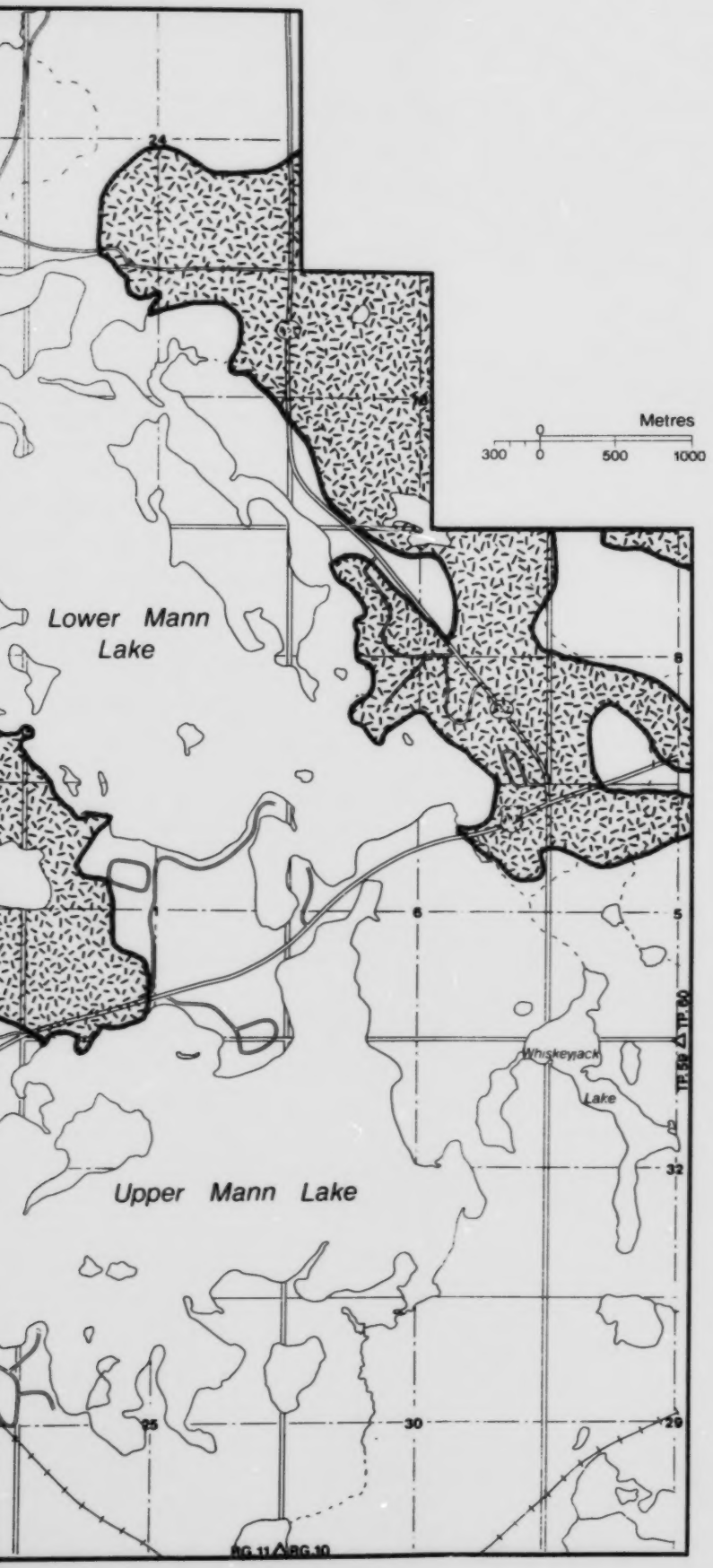
2.5 Ground Water

Minimal information is available on ground water supplies in this region. Alberta Environment has indicated that most water from local wells is obtained from aquifers in surficial deposits. The average expected yield of these wells is between 23-114 litres per minute (5-25 imperial gallons per minute). The quality of the ground water is generally suitable for human consumption. Ground water is primarily used for rural residential purposes and by lake cottage developments. The Hamlet of Ashmont utilizes treated water piped from Upper Mann Lake.

2.6 Drainage Area (Map 4)

The Mann Lakes lie at the southwestern extent of the Beaver River Drainage System. This system forms the western headwaters of the Churchill River System. The area of the watershed for the Mann Lakes is large compared to the area of the lakes, (Table 2).


Greenstreet Lake
Lower Mann Lake
Upper Mann Lake
Whiskeyjack Lake
Ashmont
C N R
Metres
300 0 500 1000
TP.59 △ TP.80
RG.11 △ RG.10



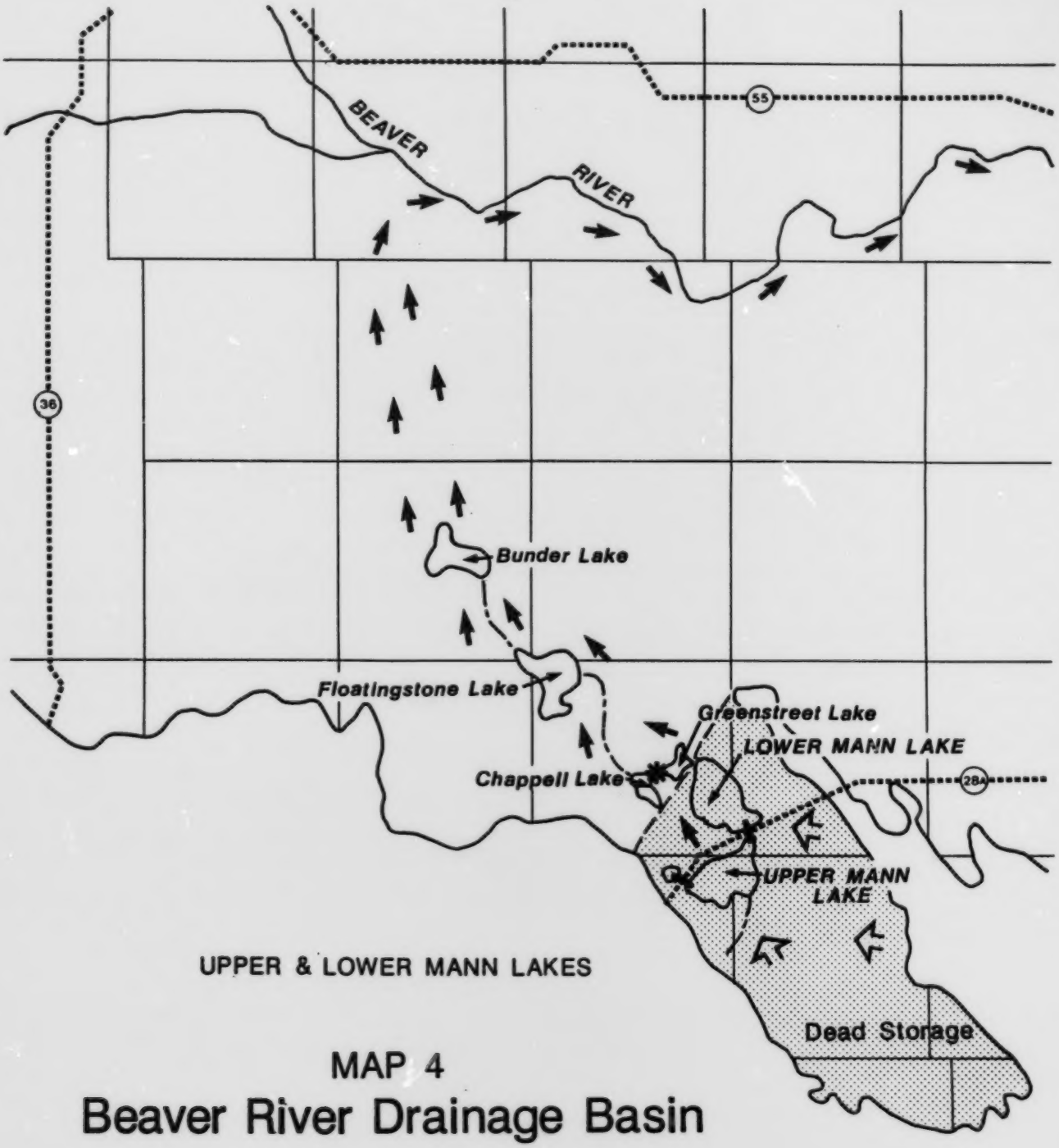
UPPER & LOWER MANN LAKES

MAP 3
Physical Land Classification

Rolling morainal plain, gentle slope 2–9%, fine loam soils, moderately well drained.

Hummocky morainal plain, moderate to strongly rolling, 9–15% fine loam textured soils, well drained.

Source: Kocaoglu, Soil Survey, 1975



UPPER & LOWER MANN LAKES

MAP 4
Beaver River Drainage Basin

Upper & Lower Mann Lakes Watershed ~159.6 sq. km.

Intermittent Stream

Weir

Culvert

Surface Inflow

Surface Outflow

Source: Alberta Environment

However, the southern half of the watershed is mostly "dead storage" due to the higher elevations surrounding the shoreline and does not contribute runoff to either lake. (Alberta Environment, Hydrology Branch). According to Alberta Environment, only when precipitation is exceptionally high would the entire watershed contribute inflow. This occurs possibly once or twice every 100 years.

The surface water within the Mann Lakes watershed flows north from Upper to Lower Mann and out to Greenstreet, Chappell, Floatingstone and Bunder lakes before emptying into Beaver River. Greenstreet Lake is actually an extension of Lower Mann with an 5.5m bridge linking the two lakes. The outflow from Chappell to Floatingstone Creek is controlled by a 5-122 cm culvert.

The amount of surface inflow is also limited by the fact that there are no major streams or rivers flowing into the lakes. Only small intermittent creeks feed the lakes; flowing seasonally their extent and depth vary with the climate. Both lakes are dependent on surface drainage and precipitation to replenish lake levels and regional ground water regimes. Precipitation accounts for more than 50% of the total inflow, (Table 3 outlines the hydrological data). Upper and Lower Mann Lakes are joined by a 2m diameter culvert under Highway 28A. However, at the present time there is no water flowing through the culvert.

TABLE 2

HYDROLOGICAL CHARACTERISTICS[1]

	Upper	Lower
Lake Surface Area (ha)	604	608
Lake Volume (Dam^3)[2]	26100	20300
Maximum Depth (m)	9.1	6
Mean Depth (m)	5.7	4
Average Lake Levels (1962-1987) (m)	615.708	615.688
Surface Drainage Area (km^2)	11.6	148
Annual Inflow (Dam^3)	1082	1760 (including 376 Dam3 inflow from Upper Mann Lake)
Annual Precipitation (Dam^3)	2222	2486
Annual Lake Evaporation (Dam^3)	2928	3254
Annual Outflow (Dam^3)	376	970
Residence Time (yrs)	56	17

(Alberta Environment, Hydrology Branch, 1989)

1 Alberta Environment has indicated that these figures do not represent input from groundwater sources. The effect of groundwater on inflow and outflow is unknown.

2 Dam^3 represents a formula for measuring the volume of water and stands for cubic decameters. There are 1,000 cubic metres of water in each cubic decameter.

Outflow is controlled by the lake levels and the amount of evaporation. Surface outflow from Upper to Lower Mann is low and on average accounts for 21.4% of the total Lower Mann inflow. In terms of residency, the water in Upper Mann remains three times longer than Lower Mann. Current lake levels are such that no water is moving through the culvert. Surface outflow from Lower Mann is more than twice that of Upper Mann and is controlled by a weir built between Greenstreet and Chappell Lake (Map 4). A site inspection in the summer of 1988 indicated no surface outflow through this weir.

The bulk of outflow occurs through evaporation. Approximately 89% of the inflow and precipitation on Upper Mann is lost through evaporation and 77% lost on Lower Mann.

2.7 Lake Characteristics (Map 6)

The Mann Lakes are characterized by an irregular shoreline consisting of countless bays and inlets. Both lakes contain numerous islands that, depending on the water levels, can be attached to the main shoreline. There are substantial growths of aquatic vegetation throughout both lakes. These appear to create artificial islands or causeways to the islands. In mid-summer both lakes are covered by an extensive algal-bloom.

While the plannning area primarily consists of a rough and rolling backshore with steep shorelines, there are limited areas of accessible and gently sloping shorelines with sandy beaches and level backshores.

The Mann Lakes are divided into two distinct lakes with Highway 28 passing directly between them. Alberta Transportation placed two large culverts between the lakes in order to permit surface flow and accessibility (Map 4). Neither lake is exceptionally large, (shoreline length for Upper Mann is 20 km and 19 km for Lower Mann) both are relatively shallow (Table 2) and have distinct water level fluctuations, (Table 3).

Upper Mann is rectangular in shape with an extremely irregular shoreline. The south portion of the lake contains a series of peninsulas and bays. These areas are protected from the prevailing winds and the water is often stagnant with excessive aquatic vegetation growth. Passage by motor boat is generally restricted. The shoreland interface is gentle to rolling. The beach consists of a mixture of sand and mud with a dense organic overlay. The eastern shoreline is strongly rolling with a steep shoreline. The beaches are sandy with isolated rock patches (Map 6). Depending on the winds this area is often covered with floating algae (Map 7). The upper northeastern arm of the lake is most frequently clogged with aquatic vegetation. This area is protected from winds and the water is shallow. The north shore adjacent the highway is gently rolling with a steep shoreland interface. Generally, the lake bottom is a mixture of mud and sand with a heavy organic overlay.

The large island is perhaps one of the more attractive areas on the lake. The south shoreline is rocky but includes a sandy beach and the slope is very gentle.

The western shoreline is strongly rolling with a steep beach gradient. There are, however, extensive areas of sandy beaches and the winds tend to keep the weeds and algae from clogging the shoreline.

The small lake north of Highway 28 is also included as part of Upper Mann. The backshore is primarily rolling with a steep shoreline gradient to the water's edge. The beach is muddy with extensive aquatic vegetation growth. (Maps 6 and 7).

The lake contours (Map 5) indicate that the deepest area of the lake occurs towards the eastern shoreline. The 7.5m contour appears to predominate throughout the shape of the lake while the bays and inlets average from 1m to 3m in depth. The lake is relatively uniform in depth with no evidence of distinctive basins. Approximately 3m from shore the depth generally averages 3m in depth and at 10m from shore, the depth is 6m. The littoral zone is excellent with an overall beach slope that permits both wading and swimming.[1]

[1] A littoral zone relates to the type of lake shore. Extending from the water's edge to some arbitrary shallow depth of water, the littoral zone determines the suitability of any shoreline for recreational activities. Good swimming beaches usually consist of extended and shallow littoral zones, with gradually sloping contours.

UPPER & LOWER MANN LAKES

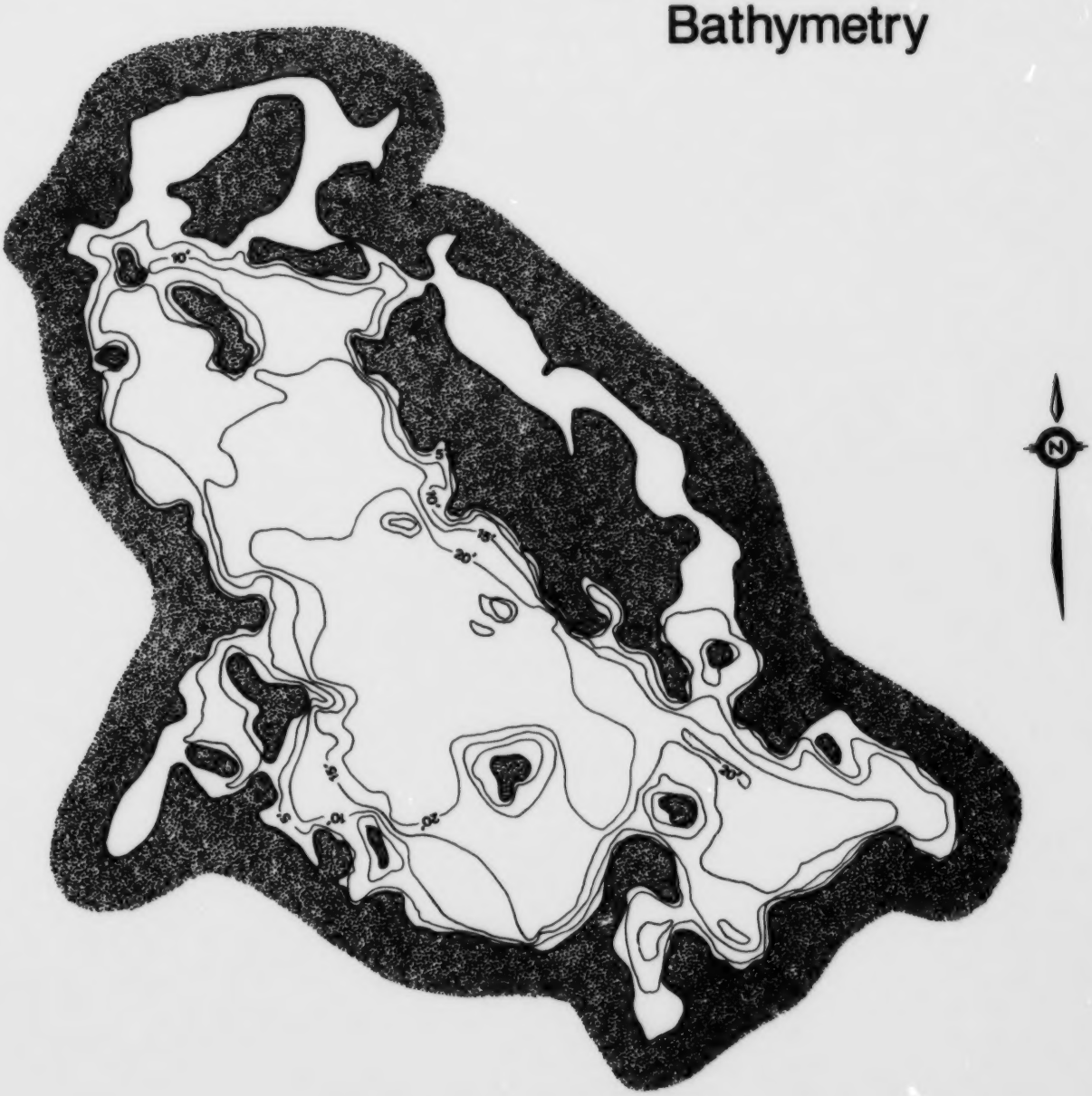
MAP 5

Upper Mann Lake Bathymetry

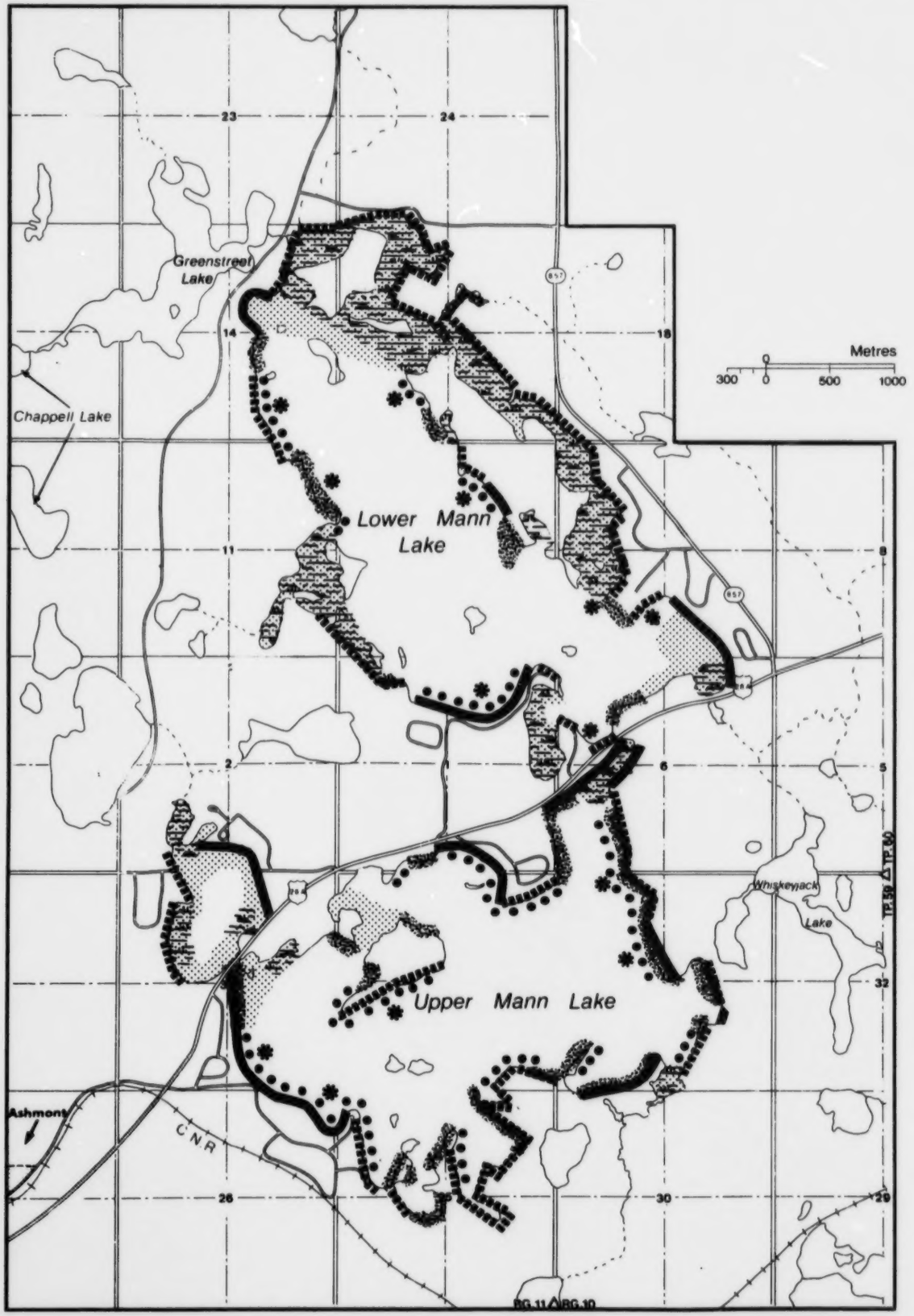
Source: Alberta Environment

UPPER & LOWER MANN LAKES

MAP 5a
Lower Mann Lake Bathymetry



Source: Alberta Environment



UPPER & LOWER MANN LAKES

MAP 6
Shoreline Characteristics

- Rocky
- Sand
- Mud
- Gentle Shoreline
- Steep Shoreline
- Wet/Dry Beach
- Marsh

Source: Alberta Municipal Affairs, 1988

Lower Mann Lake is linear in shape and is also characterized by an irregular shoreline with numerous bays and inlets. The eastern and northern areas are rolling but with a much gentler shoreline. The beach area consists of a mixture of sand and mud with a dense organic overlay (Map 6). This area is almost impassable due to the extensive emergent and submergent aquatic vegetation (Map 7). The western beach contains very gentle shore and slopes. The sandy shoreline and limited aquatic vegetation growth contribute to the best beach on either lake. The southern area is rolling with a steep gradient. The small peninsula creates an isolated bay which is filled with aquatic vegetation and covered with algae. The north shore of the peninsula is sandy and the winds prevent algae build-up. The southeastern bay is strongly rolling with extensive aquatic vegetation. The beach area also consists of a combination of sand and mud with a heavy organic overlay.

The lake contours (Map 5a) indicate that Lower Mann is shallow with expansive littoral zones. The southeastern area has a maximum depth of 4.5m approximately 150m from shore. At 3m from shore the depth is less than 1m. The northwestern shoreline is also extremely shallow with a maximum depth of 3m located between 60m and 150m from shore. The deepest portion of the lake occurs in the centre. Along the western and southwestern shoreline a gradual slope from 1m to 5m occurs between 3m and 15m from shore, providing excellent swimming. The southern shore, including the bay area, has a maximum depth of 3m.

2.8 Water Levels

With only intermittent and seasonal streams, the extent and depth of the lakes varies with climatic conditions. During prolonged wet spells the lakes will rise considerably while during dry periods, lake levels will drop.

Alberta Environment has monitored the water levels of Upper Mann Lake since 1962 and that of Lower Mann since 1973. Water levels in both lakes were high in 1979 but by late 1988 had dropped to historic low levels. During this period, both lakes declined by 1.3m (Alberta Environment, Survey Branch, 1988). This drop reduced the overall surface area of Upper Mann by 7% and Lower Mann by 17%, (Table 3).

TABLE 3

WATER LEVEL[1]

	Low	High
1962-1981	615.486 m	615.578 m
1983	615.471 m	615.503 m
1984	615.462 m	615.546 m
1985	615.431 m	615.727 m
1986	615.348 m	615.542 m
1987	615.217 m	615.487 m

1:100 year flood level is estimated at 616.305 m for both lakes. (Alberta Environment Water Quality Branch, 1988)

In 1977, responding to concerns from local residents, Alberta Environment constructed a weir between Greenstreet and Chappell Lakes (Map 4). The weir consists of a concrete dam designed to stabilize lake levels on Upper and Lower Mann Lakes by preventing outflow under 615.848 m^2. The project was built to ensure fish survival during the winter and to safeguard recreational use. The level chosen was identified as the mean high water mark towards the upper end of the natural fluctuation range and a point that minimized the amount of lands flooded. Alberta Environment has indicated that flood control may have been an incentive as the structure was built following complaints of local flooding.[2]

The Hamlet of Ashmont municipal water system connects to Upper Mann Lake. The Hamlet currently draws 65,375 cubic meters(53 ac ft) of water per year. Alberta Environment and the County of St. Paul have noted that this annual withdrawal is insignificant with respect to the lake water levels.

Alberta Environment has also indicated that based on data recorded within the vicinity of Mann Lakes, ground water levels are not currently at their lowest levels.

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1 Alberta Environment notes that there are only minimum elevation differences between the two lakes. Only during periods of excessive rain could significant differences occur. Lake levels for Upper Mann would rise substantially faster due to the larger area of the watershed.

2 Since the weir was completed in 1983, the lakes have not risen to expected levels. Alberta Forestry Lands and Wildlife stated that this was due to insufficient precipitation.

3.0 BIOPHYSICAL RESOURCES

3.0 BIOPHYSICAL RESOURCES

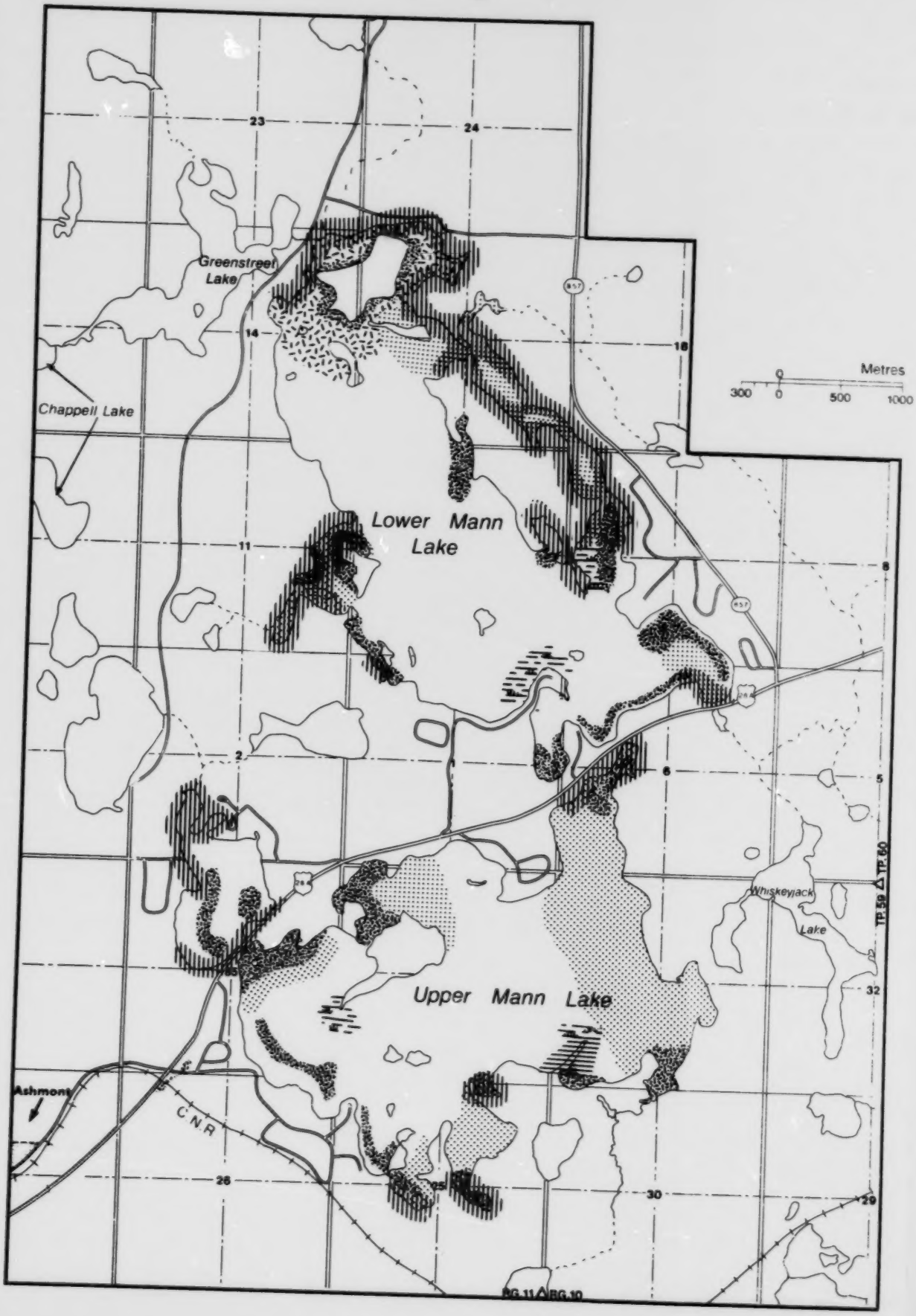
3.1 Shoreline Vegetation (Map 7)

The irregular and contorted shape of both lakes as well as the shallow shorelines contribute to a very rich and productive aquatic vegetation habitat. Further, the numerous bays and inlets, sheltered from the prevailing winds and wave action, become deposit areas for excessive amounts of fine silts and clays. Protected from normal lake circulation these areas maintain a slightly higher water temperature. The result is that both lakes are fringed by lush communities of emergent and submergent aquatic vegetation.

The north and eastern shorelines of lower Mann Lake are completely covered in both emergent and submergent aquatic vegetation. Cattails and bulrushes predominate and prohibit passage along the eastern boundary of the island. The surface area is also covered by a thick layer of planktonic algae. Along the northern shore the plants grow beneath the water surface rooted to the lake bottom. In this area, filamentous algae has attached itself to a submergent water milfoil impeding motor boats and preventing recreational activities.

The western and southern shorelines are relatively free of aquatic vegetation as the wind and wave action impedes plant growth. There are random areas of submergent plants; water milfoil, coontail and pondweeds. Adjacent to the residential subdivisions, the lot owners seasonally remove the plants.

In Upper Mann Lake, the eastern and southern shorelines are clogged with both emergent and submergent plants. The gentle shoreland and numerous bays along the south shore offer excellent growing conditions for cattails and bulrushes as well as pondweeds and water milfoil. The steeper shoreline along the eastern end of the lake restricts emergent vegetation but excessive growths of submergent plants are evident. The northern and western shorelines are relatively clean but the gentle beach slopes and protected bays provide excellent habitats for water milfoil. These areas are seasonally cleared by the residential lot owners. Surface blooms of planktonic algae cover most of the lake during the summer months. In the eastern and southern bays and inlets the algae restricts recreational activities.



UPP

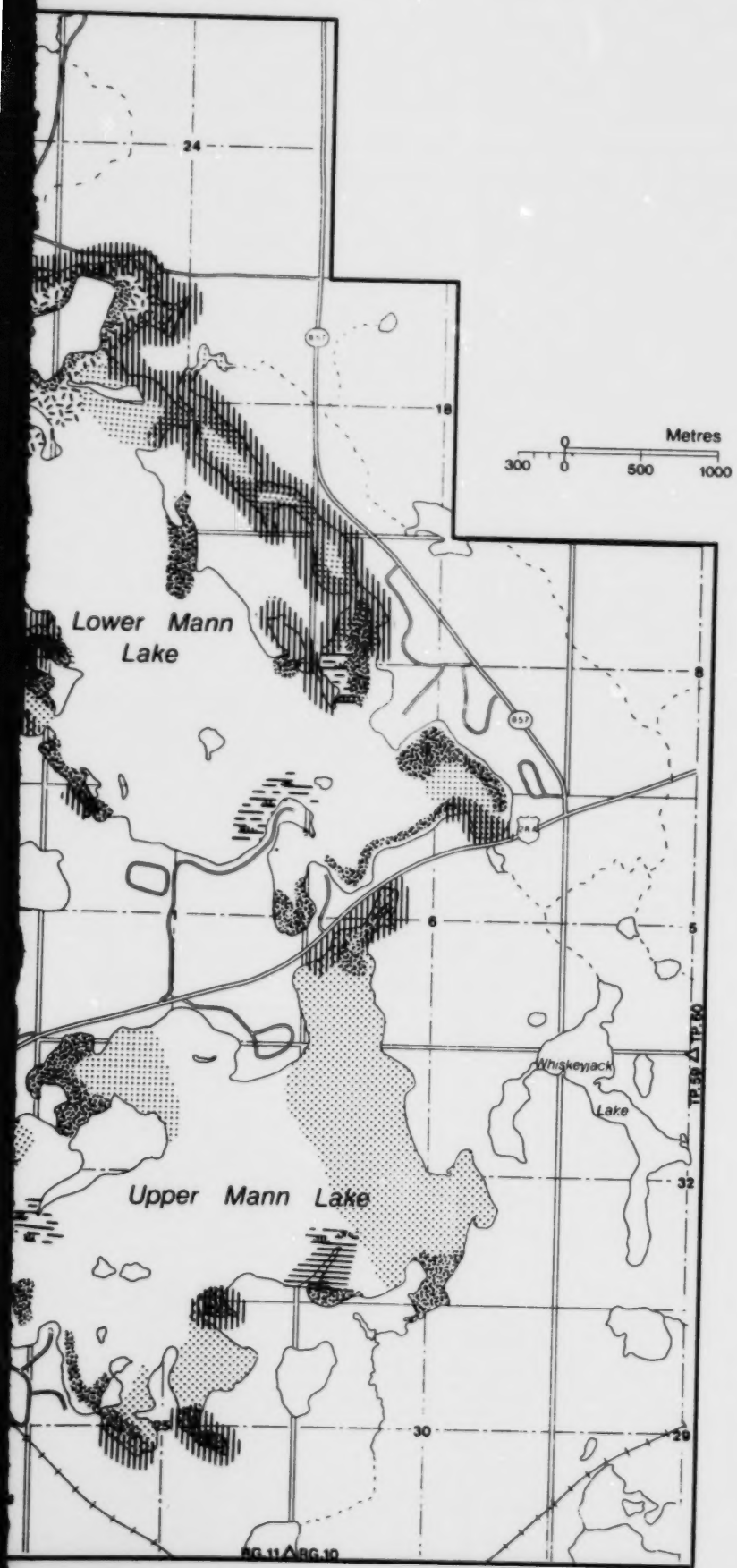
Sho

ZONE:

Source:

UPPER & LOWER MANN LAKES

MAP 7
Shoreline Vegetation



ZONE:

Emergent:
cattails, bulrushes
reedgrass

Submergent:
watermilfoil, pondweed

Algae:
filmentous
planktonic

Source: Alberta Municipal Affairs, 1988

3.2 Water Quality

The Environmental Quality Monitoring Branch, Alberta Environment undertook water quality sampling for Upper and Lower Mann between 1979 and 1984. The lakes are characterized by high nutrient levels and excessive aquatic plant growth. In winter, dissolved oxygen levels are low; anoxic conditions may result in severe winterkills of perch and pike[1]. Alberta Environment has stated that Upper Mann is eutrophic and Lower Mann is hyper eutrophic.

Eutrophication occurs as nutrients from the natural watershed, livestock waste, phosphates in agricultural fertilizers, human sewage and soil sediment are released into a lake. Aquatic plants will grow where a rich supply of nutrients exist. When this plant life dies, oxygen is consumed during the process of decay and nutrients are released into the water, which in turn results in more plant growth and decreased oxygen levels. Eventually, the lake is characterized by excessive aquatic plant growth, summer algal blooms, deficient oxygen supplies and decreased fish populations.

Current agricultural practices within the planning area and residential developments along the shoreline are major contributors of nutrients. Cattle permitted to graze along the water's edge or confined adjacent to the shoreline add nutrients to the lakes.

The poor soil fertility within the planning area has resulted in extensive amounts of chemical fertilizers being added to ensure successful crop production. Phosphates generally constitute a major component of these fertilizers and through leaching and surface runoff are indirectly added to the water[1]. Chemical fertilizers are also indirectly added by lot owners who have cleared their property to grass. The cleared shorelines reduce the vegetative uptake of nutrients from surface runoff and increase soil erosion. Alberta Environment indicated that there has been no study to confirm whether or not human sewage is being added to the lakes. They did, however note that one cow could add 16 times more phosphates than one human in a year.

[1] "Anoxic" is a lack of dissolved oxygen in the lakes. An anoxic condition results from high rates of respiration and decomposition.

Alberta Environment has noted that perhaps the largest source of phosphorous to the Mann Lakes comes from the lake bottom. Under certain conditions, such as boat and wave action, phosphates accumulated in the mud are dispersed throughout the overlying water thus stimulating even more algae and aquatic plant growth. (Alberta Environment, Planning Division, 1989)

The physical characteristics of Mann Lakes are such that they cannot tolerate high nutrient input without suffering considerable water quality degeneration. Low water levels, poor inflow and outflow volumes irregular shorelines and high residency time all contribute to the highly eutrophic conditions of both lakes.

3.3 Fisheries (Map 8)

The Mann Lakes contain three sport fish species: northern pike, yellow perch and walleye. However, the Fish and Wildlife Division of Alberta Forestry, Lands and Wildlife has indicated that walleye are extremely rare[2]. Non-game species identified include white suckers and brook stickleback. There have been no commercial fishing seasons since the late 1940's and no licenses issued to domestic fishermen since 1983 when the licensing system was started.

In 1952, Lower Mann was stocked with 18,000 perch and Upper Mann received 68,000 perch following a severe winter kill. Pike were planted in both lakes the following year. Upper Mann was again stocked with 190,000 perch fingerlings in 1960 and with 12,500 walleye in the fall of 1984. There is a plan to re-stock both lakes in the near future.

Map 8 indicates known and potential spawning areas in both lakes. Zones of emergent vegetation provide the best habitat throughout the lakes for spawning, foraging and hiding. The entire bed and shore of both lakes are identified as sensitive areas. Key habitat areas are located between Greenstreet and Chappell Lake, the northern shore of Greenstreet Lake, the northeastern shoreline of Lower Mann and the southwestern shore of Upper Mann.

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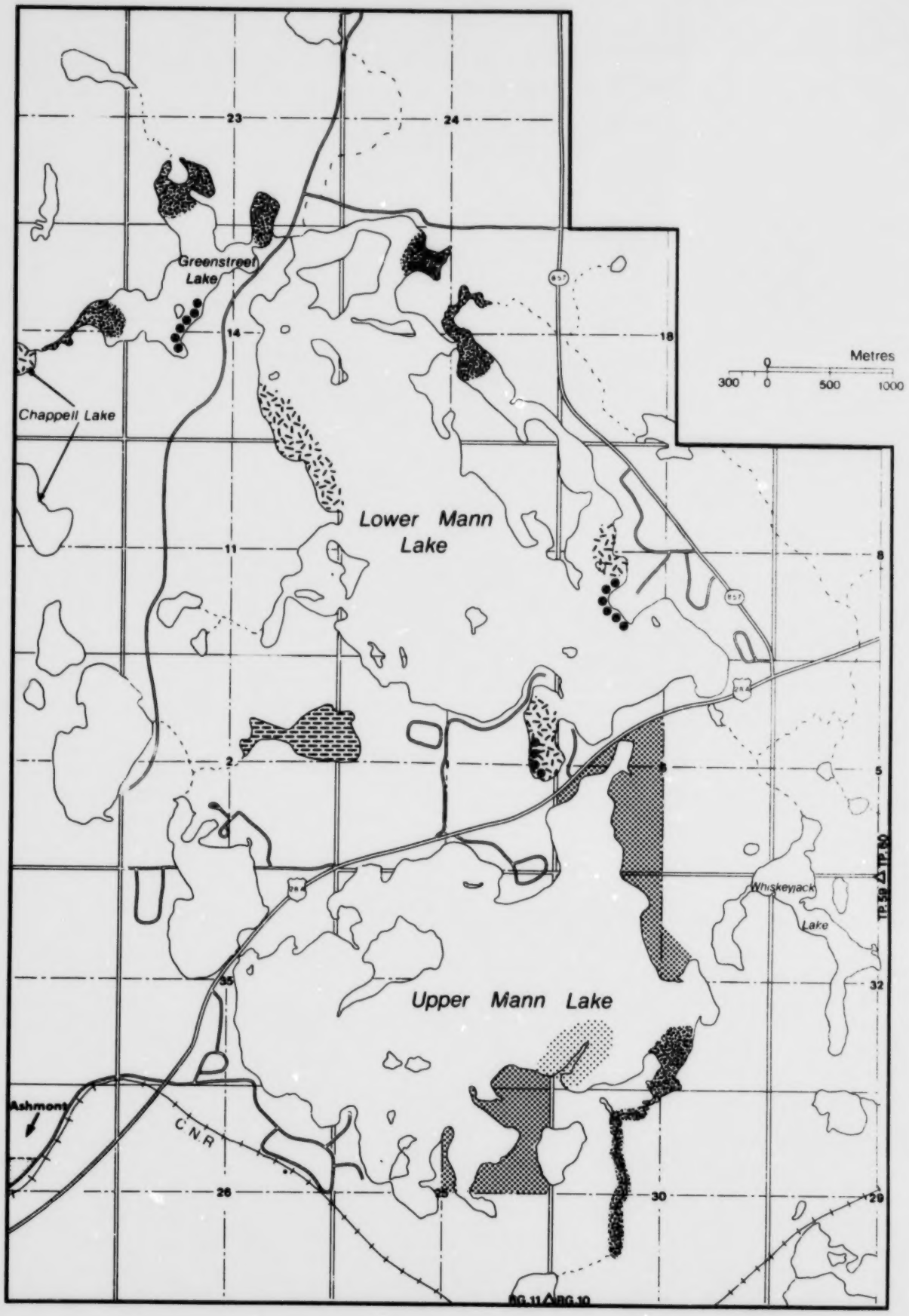
1 Alberta Environment noted that phosphates are the major contributor aquatic plant growth.

2 Fish and Wildlife biologists note that there is only one record of a walleye caught since 1984. Local residents in 1989 indicated that walleye had been caught in Upper Mann.



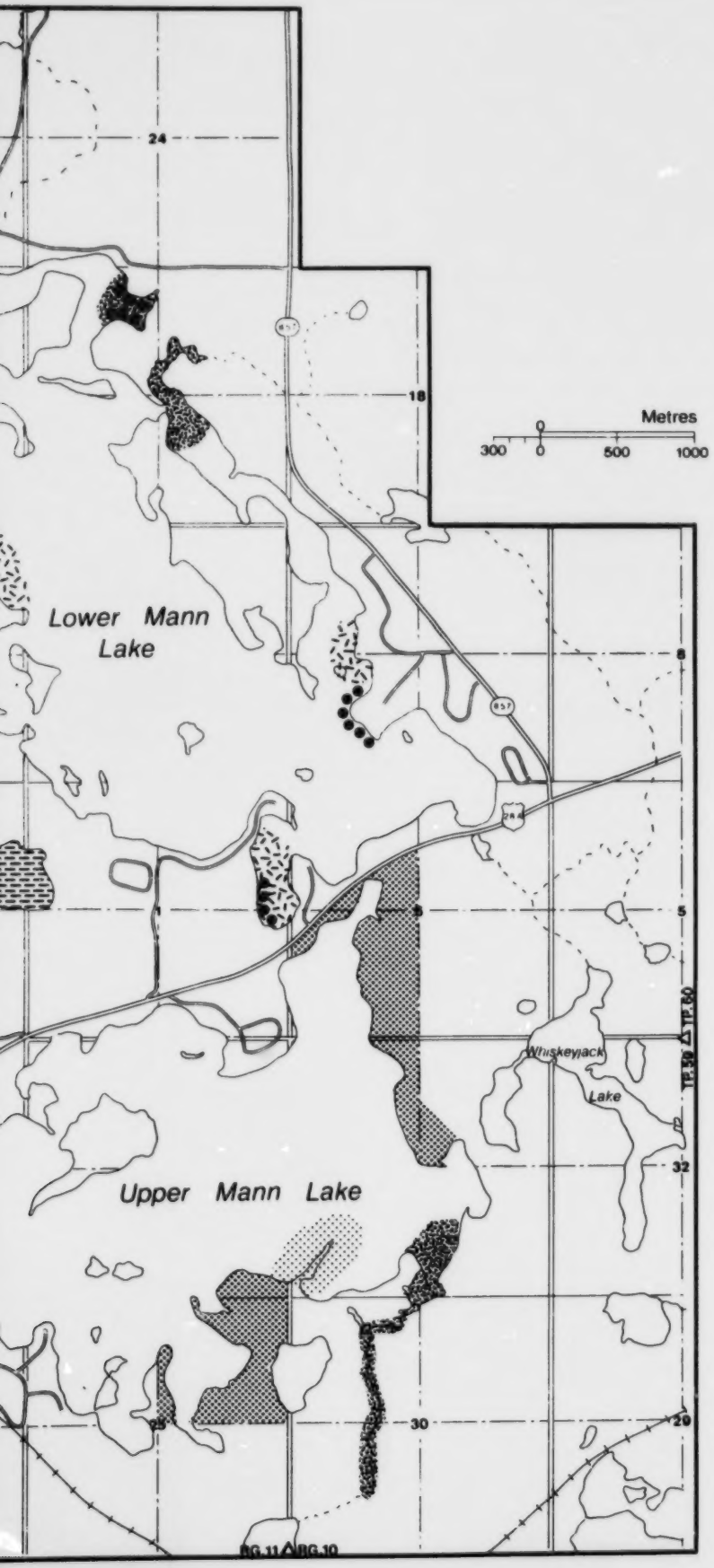
UPPE

F

FISHERIES:

WILDLIFE:

Source:
Fish



UPPER & LOWER MANN LAKES

MAP 8
Fish And Wildlife Habitat

FISHERIES:

- Key Spawning Areas
- Potential Spawning Areas
- Winter Kill Sites

WILDLIFE:

- Ducks Unlimited
- Cormorant Colony
- Buck For Wildlife

Source: Alberta Forestry Lands and Wildlife, Fish and Wildlife Division, St. Paul

Overall, the Mann Lakes provide only a marginal fishery[1]. Excessive summer and winter fishing, increased aquatic vegetation and lake eutrophication has begun to affect fish survival. Upper Mann Lake has severe winterkill in some years and partial winterkill one year in five. Lower Mann winterkills severely in most years but has been repopulated with pike and perch moving from Upper Mann through culverts under Highway 28A. Residents have indicated that low water levels have disrupted this flow and the fish catches on Lower Mann have dropped dramatically. While the winterkills keep the population size of pike and perch low, the high nutrient levels in the lakes promote abundant food production; therefore the growth rate of surviving fish is rapid. When the lakes do not winterkill and water levels permit movement through the culverts, the fishing can be excellent. (Alberta Fish and Wildlife Division, 1988).

Alberta Forestry, Lands and Wildlife has sponsored a Buck for Wildlife program on Upper Mann Lake, (Map 8). This program utilizes money from fish and game licenses to enhance fish and wildlife habitats on private and crown lands. On Upper Mann, they have fenced land to keep livestock from the shoreline to protect fish spawning areas.

3.4 Wildlife

The planning area is quite productive for a number of waterfowl species and the Mann Lakes are valued for their diversity. The predominant species are mallards, red necked grebe, blue winged teal and lesser scaup. Upper Mann contains a substantial cormorant colony and pelicans are often seen on or near the islands, (Map 8). The shoreline and surrounding vegetation offers excellent breeding, feeding and hiding habitats. The steep topography, low soil fertility and developed shoreline does, however, limit the overall habitat potential. In order to protect existing habitats, Ducks Unlimited has Licenses of Occupation on the bed and shore of portions of Greenstreet and Lower Mann Lake and an unnamed slough west of Lower Mann. The Crown Lands also contain protective notations identifying the southeast shore and the island in Upper Mann as waterfowl habitat protection areas.

Upland game bird species in the area include Ruffed Grouse, Spruce grouse and sharp-tailed grouse. Lower Mann has contained nest sites for osprey, heron, and owls. Eagles were sighted on Upper Mann during field surveys of 1988.

Ungulates in the area include whitetail deer and moose. Although the overall habitat is moderately high, densities are low, probably due to the rough terrain and easy accessibility by hunters[2]. Buck For Wildlife has sponsored fencing on the south shore of Upper Mann Lake for upland game habitat enhancement (Map 8).

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1 A creel census was conducted in 1975 which indicated a high catch rate for pike and an average catch rate for perch. There have been no recent surveys conducted and there is no estimate of total harvest from either lake.

2 No statistical information is available on hunting intensity or harvest in the planning area.

3.5 Recreation

Four parameters or indicators of recreational suitability were examined in order to assess the physical capabilities of the study area to support recreational use and development These parameters are: the Canada Land Inventory Recreation Capability Rating; shoreline assessment; topographic assessment; and, soil suitability for sewage disposal and intensive recreation use.

C.L.I. Recreation Rating (Map 9) - The Canada Inventory Recreation Capability Rating provides an assessment of the intensity of recreation use a unit of land has the inherent capability to support. The C.L.I. rating also identifies, in order of priority, the type of recreation activities suited to the physical attributes within each unit.

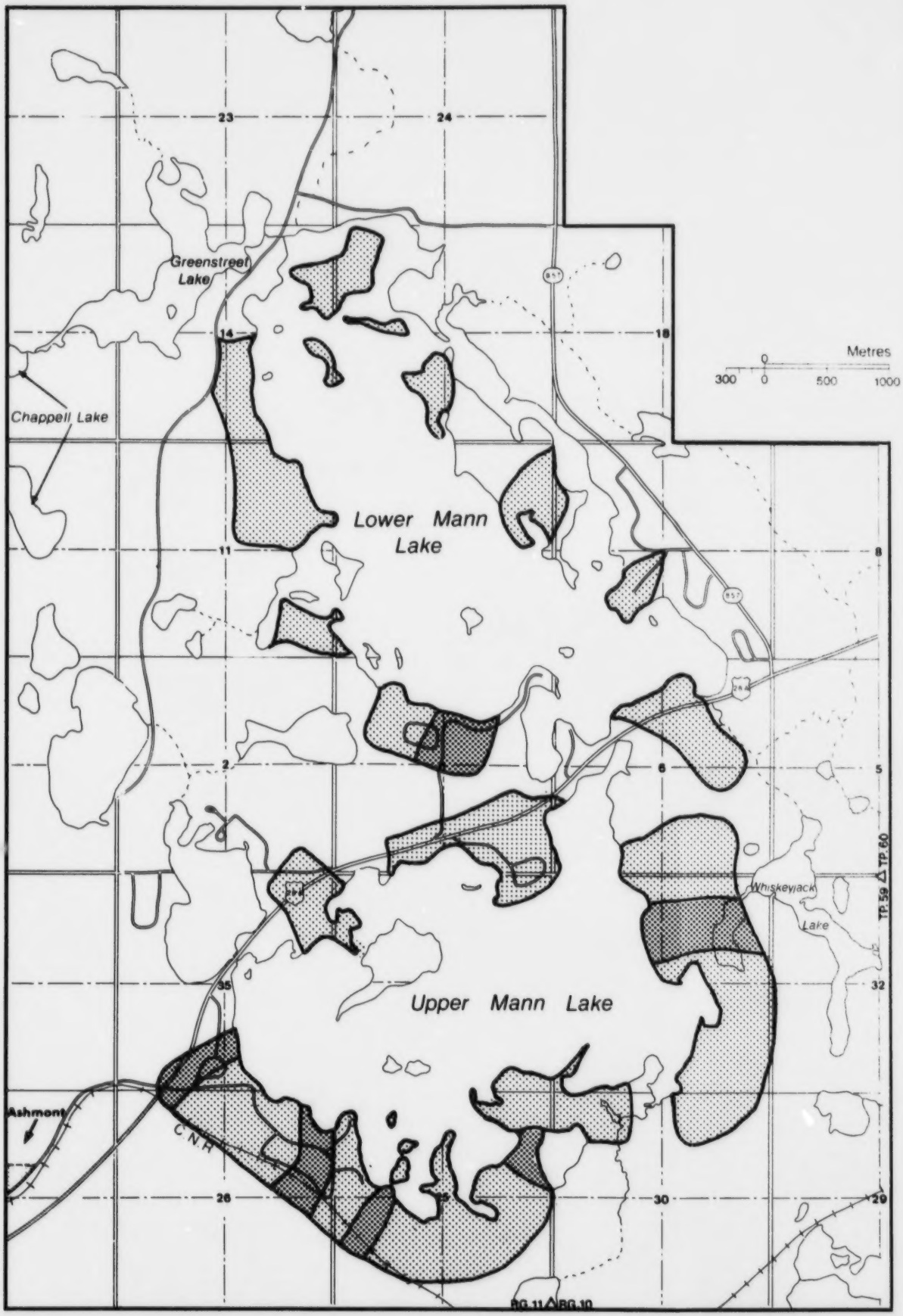
The shoreline of the Mann Lakes has varying capabilities for outdoor recreation activity, ranging from moderately high (Class 3) to moderately low (Class 5). The majority of the shoreline, however, has only moderate to moderately low capabilities, (Class 4 and 5) (Table 4). These Class 4 and 5 areas are capabie of sustaining only minor recreational pursuits and are not generally suited for family beach activities. They have a natural capacity to sustain only moderate annual use based on dispersed recreational activities. Usually only the highest three classes (1-3) are considered capable of supporting intensive uses. Table 4 indicates that the Mann Lakes have limited good quality recreational shorelines. Most of the existing Class 3 land has previously been developed with the balance on Upper Mann being used for wildlife enhancement.

TABLE 4

SHORELINE CAPABILITY

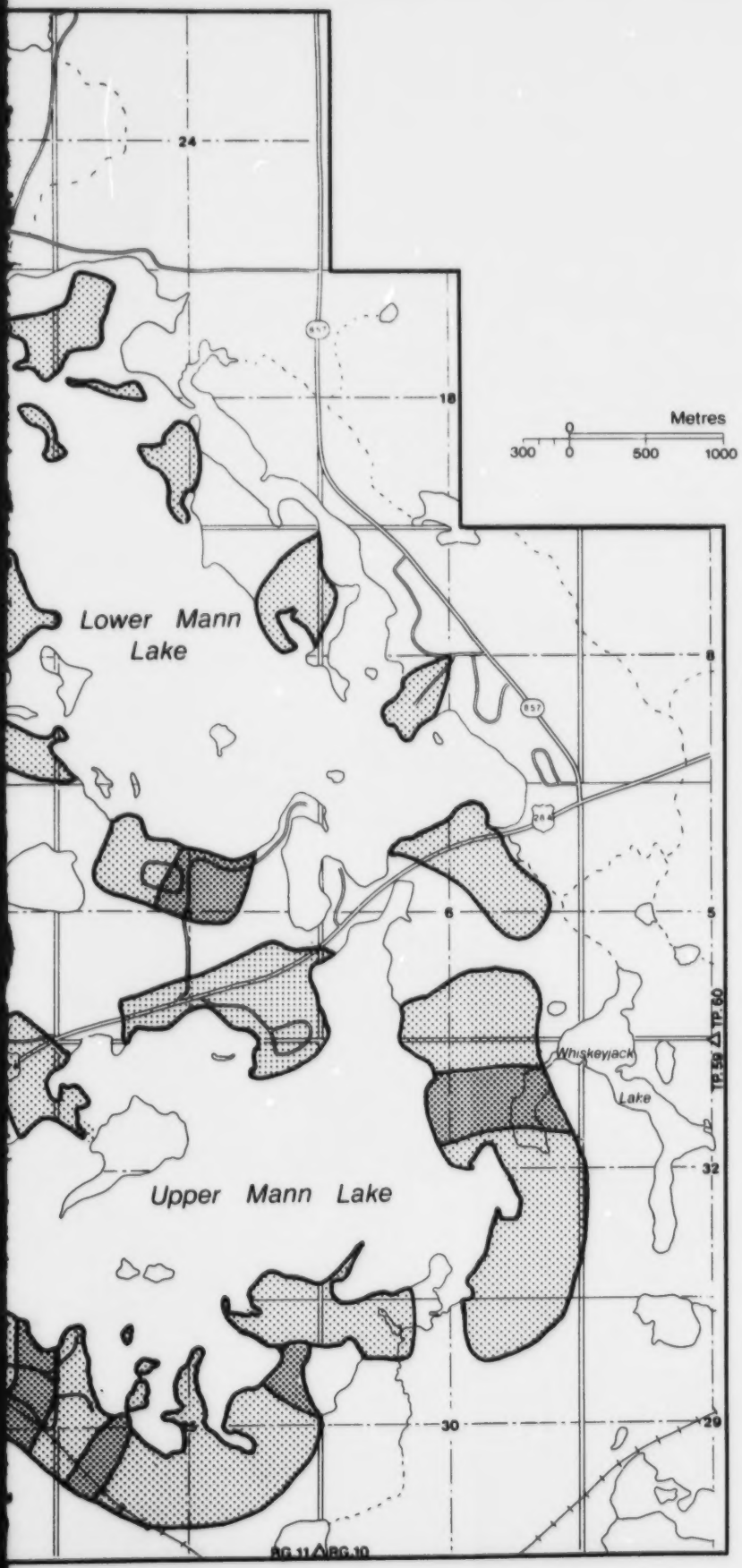
	CLI Class	Beach Areas	Total Shoreline Length
Upper	3	5	1 km
	4	8	15.5 km (77.5%)
	5	8	3.5 km
Lower	3	1	.5 km
	4	8	4 km
	5	10	15.5 km (81.5%)

(Source: Canada Land Inventory)


Greenstreet Lake
Chappell Lake
Lower Mann Lake
Upper Mann Lake
Whiskeyjack Lake
Ashmont
C.N.R.
TP.59
TP.60
BG.11
BG.10
Metres
300 0 500 1000
23
24
14
18
11
8
2
6
5
35
32
26
30
29

UPPER & LOWER MANN LAKES

MAP 9
Land Capability For Recreation



Class 3 – Moderately High

Class 4 – Moderate

Class 5 – Moderately Low

Source: Canada Land Inventory

Throughout the planning area the backshore is identified as Class 5. This land exhibits a wide variety in topography and offers good opportunities for general outdoor recreation activities such as hiking, trail riding and cross country skiing.

Shoreline Assessment - The field survey determined that both lakes contained numerous wet beaches but were restricted by a lack of dry beaches.[1] The lake contours are gentle providing excellent opportunities for wading and swimming (Map 6). The backshore slopes, however, are often very steep, restricting access and use of the shorelands. The main problem is the extensive areas of aquatic vegetation which cover most of the lakes (Map 7). The bays and inlets, while offering excellent wet/dry beach areas are unuseable due to algae, milfoil and a deep organic layer on the lake bottom. The eastern shores of both lakes are often impassable due to aquatic vegetation or unuseable due to the thickness and smell of the algae. This is also true along the north shore of Lower Mann and the south shore of Upper Mann.

The western shorelines offer gently sloping littoral zones, slightly rolling backshore and limited shoreline vegetation. These areas offer a good combination of the wet/dry beach qualities necessary to support any type of intensive beach or water-contact recreation activity.

Topographic Assessment - The topography and relief of an area can offer both opportunities and limitations for use and development. In combination with other factors, steeply sloping topography can be visually attractive but subject to slippage and erosion. Flat or gently undulating topography may not be visually interesting, but can offer fewer physical constraints to facility (cottage) development.

[1] Wet beach - refers to that portion of the lake bed and shore located below the lake's high water mark and commonly used for wading or swimming.

Dry beach - refers to that portion of the lake shoreline located between the lake's high water mark and the commencement of permanent shoreland vegetation cover.

Map 3 depicts, in a generalized manner, the topography of the planning area. The majority of shoreland is moderately rolling with slopes averaging between 9-15%. This greatly restricts backshore development and lessens the quality of beach activities. Erosion and soil slippage on these slopes pose serious constraints to structural development. Further, vegetation removal on these slopes to clear a development site, greatly increases the soil nutrients being eroded into the lake. The balance of the shoreline is characterized by gently undulating topography (0-5%) with a gentle beach/shore interface. These areas are suitable for all types of recreational activities.

Overall, the rough topography provides excellent natural vistas and an interesting and unique environment but greatly restricts development.

Soil Suitability - A general analysis of the suitability of soils located in the planning area for on-site sewage disposal and intensified recreational use, indicates that there are only minor limitations for development. The high clay content in the local soils gives slow percolation rates by filtering disposed sewage. The potential for ground water contamination or discharge into the lake is, therefore, lessened. However, the soils along the eastern shoreline of Lower Mann have a high organic component with a high potential for ponding and surface flow. Development along this area could lead to direct sewage discharge into the lake.

3.6 Agriculture

The Canada Land Inventory and the County Farmland Assessment Rating both classify the land in the planning area as having severe limitations for the production of field crops. Most of the area is suitable only for pasture and hay production, (Table 5 and Map 10).

TABLE 5

AGRICULTURAL LAND USE

Field Crops	Pasture	Forests	Sloughs	Residential
15%	30%	34%	10%	11%

According to the Canada Land Inventory, the land is primarily Class 5. There are no areas designated in the first four C.L.I. classes (i.e. those considered to be capable of sustaining production of common cereal crops). In general, the limitations are related to adverse topography (steepness) and an undesirable soil structure which is difficult to till. The major limitation for agriculture is that the soils have a low natural fertility for sustained use by field crops. If used for grain production, profitable farming would be dependent upon improvement of soil fertility by heavy chemical fertilizer applications. The agricultural fieldman for the County of St. Paul indicated that farmers within the planning area generally use urea fertilizer 46-0-0; a pure nitrogen fertilizer promoting the fast growth of grasses and other forage plants. Table 5 indicates that cereal crop productions is not considered an important land use within the planning area. Overall, the soils are best suited for pasture.

Most agricultural activity occurs adjacent the eastern and western boundaries of the planning area. There are two livestock operations adjacent to Lower Mann Lake. Along the northshore a farm operation maintains approximately 200 cow-calves while along the southwest shore, adjacent Highway 28A, a ranching operation keeps approximately 100 cow-calves. Field surveys in the summer of 1988 noted that cattle from both operations are permitted direct lake access for watering. This is also true for the portion of Upper Mann north of Highway 28 and along the southeastern shoreline of the main lake. Discussions with the district agriculturalist indicate approximately 300 cow calf units would have direct access to the Mann Lakes during the summer and winter months (Map 10).

There are several large areas of Crown Land held under private disposition by grazing leases and a single grazing permit. These areas are utilized by the lessee to feed and water livestock. On Lower Mann the leases (Map 10) border the water's edge and cattle are permitted direct lake access. On Upper Mann, the Buck For Wildlife fence was installed to prevent cattle accessing the lake.

3.7 Historical Resources

There are no records that the Mann Lakes contain historic period structures. (Historic Sites Service, Alberta Culture and Multiculturalism). The Archaeological Survey of Alberta has indicated that the historical resources of the planning area have yet to be documented and the current record of resources is not thought to be representative of the potential historical resources. The results of field inventories in similar settings to the Mann Lakes have resulted in the discovery and documentation of significant archaeological sites and many of these occur within close proximity to present and abandoned shoreline features.

Currently, there is one recorded site on Upper Mann Lake which consists of two rectangular structural outlines both of which contain cellar depressions. While there is no indication of the age of these structures, they are believed to be more than fifty years old. These structures are located in the SW 2-60-11-4. (Alberta Cultural, Archeological Survey).

4.0 LAND RESOURCES

4.0 LAND RESOURCES

In this Section, an inventory of the current land tenure and ownership is provided along with the results of the property owner questionnaire. The inventory is based on the type, location, use, development activity and ownership for all land within the planning area. The current municipal infrastructure including, roads, waste disposal sites, utilities, water supply and public reserves is also identified.

4.1 Land Use (Map 10)

Most of the land within the planning area is held by private ownership with approximately 25% held by the Crown. Existing residential and recreational development is extensive. There are 19 registered residential subdivisions containing 485 lots; 226 (47%) are developed for permanent or seasonal occupancy. It was estimated that of the 226 development lots, 85% (192) are seasonally occupied. Table 6 outlines existing land use within the planning area.

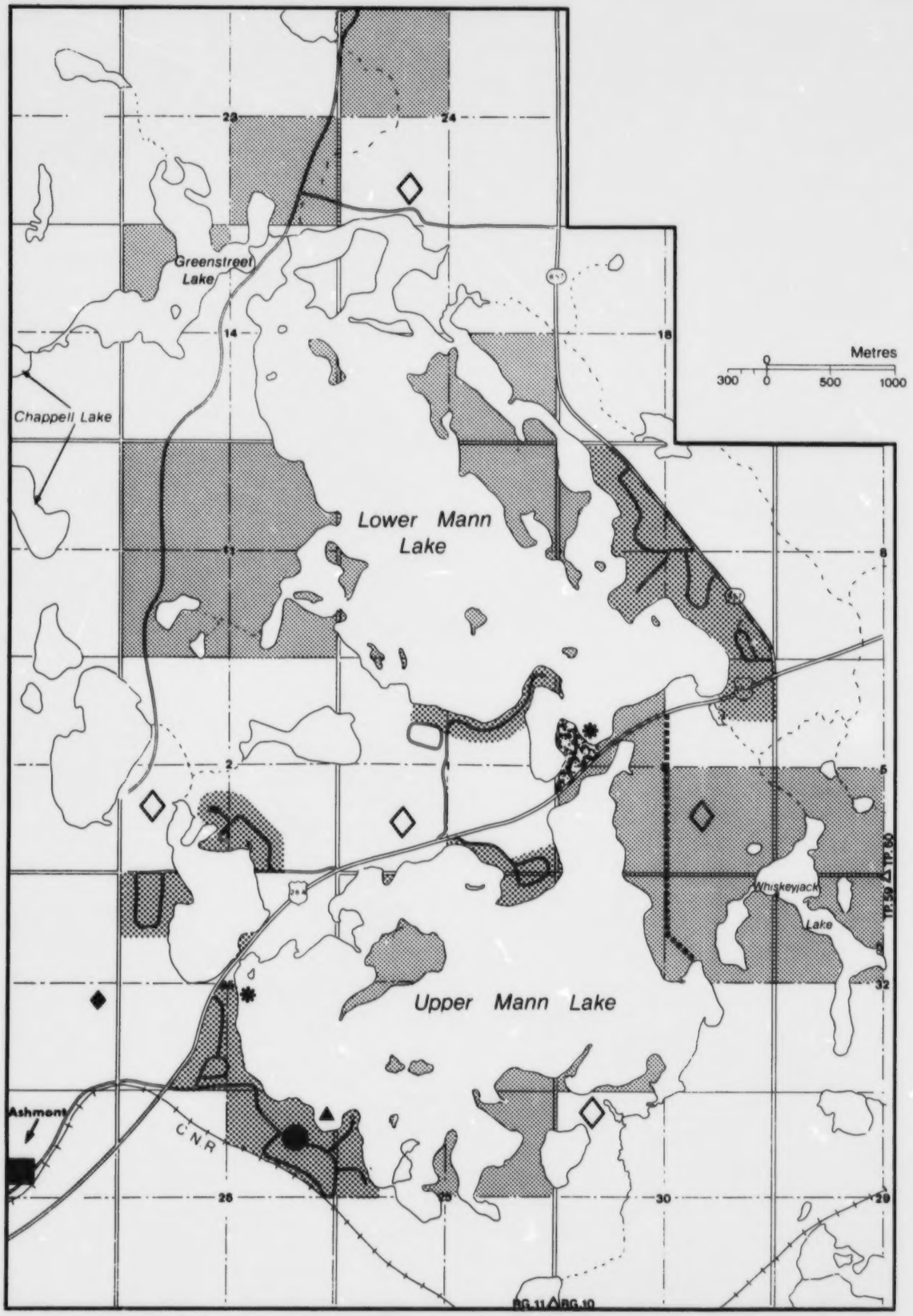
TABLE 6

LAND USE

	Planning Area (excluding lakes)	Crown Land (%)	Registered Residential Lots	Developed Residential	Developed Shoreline
Upper Mann	-	14	288	148 (51%)	35%
Lower Mann	-	11	197	78 (42%)	25%
Total Planning area	16.5 sections (42.5 sq. km)	25	485	226 (47%)	30%

	Provincial Park Sites	Municipal Reserves	Public Beach Areas	Public Boat Launching Facilities
Upper Mann	0	22ha	2	1
Lower Mann	1	39ha	1	1
Total Planning Area	1	61ha	3	2

(Source: Alberta Municipal Affairs, Field Survey, 1989)



UPPER & LOWER MANN LAKES

MAP 10
Land Use Classification

- Crown Land
- Registered Residential Lots
- Agriculture/Forested
- Public Boat Launch Area
- Public Beach Area
- Provincial Park
- Hamlet of Ashmont
- Hamlet of Bayview Beach
- Landfill
- Cow-Calf Operation
- Buck For Wildlife Fence

Source: Alberta Forestry, Lands and Wildlife, County of St. Paul

The County has developed a public boat launching facility on the northwestern shore of Upper Mann as well as a public beach area along the southwestern shore. There are no public facilities at either location except for a cement launching ramp (no pier) at the north site and a cleared beach to the south. Access is maintained by the County. There are numerous private piers and beach areas developed throughout both lakes and a public pier has been developed at Cameron Cove for the registered lot owners. In some cases, private development of municipal reserve lands has occurred. While these areas could be considered as public property, there has been no advertisement of these facilities for public use .

There is a large provincial park located on the southern shore of Lower Mann Lake, accessed by Highway 28. This park is further discussed in Section 4.2.

The registered subdivisions do not have municipal services other than road maintenance. There are telephone and gas hook ups available and a water pipeline is being discussed for the Hamlet of Bayview Beach. A landfill site outside Ashmont is available for garbage disposal. Drinking water is available at the Provincial Recreation Area via a water pump. There are no other public water wells.

There are no commercial recreational developments on either lake nor any commercial services. Retail services are provided in the Hamlet of Ashmont.

The Crown Lands are administered by Alberta Forestry Lands and Wildlife. Approximately half of this land has been leased to local farmers for cattle grazing. These grazing leases (GRL) or grazing permits (GRP) permit the lessee to run cattle on the Crown Land.

The majority of land in the planning area is still in a natural state either forested or used as pasture, (Table 6). The southeastern portion of Upper Mann and the northwestern portion of the Lower Mann area are virtually uninhabited. These areas are densely treed and pitted with sloughs. The islands are also left in their natural state. Overall these natural areas account for 65% of the total planning area.

The principle access points to the planning area are provided by Highway 28 and Secondary Road 867. A series of municipal roads provide site specific access to each of the registered subdivisions. A CNR line runs along the southwestern edge of the area. There are no roads to any of the islands and outside of the residential areas there is only limited accessibility.

4.2 Provincial Recreation Area

The provincial recreation area on Lower Mann Lake has been one of the most popular and heavily used sites in northern Alberta. It is operated and maintained by Alberta Recreation and Parks. The site is primarily used on summer weekends with peak use occurring on the long weekends, (Map 10).

The site covers 7 ha and contains: 70 designated overnight camping sites, vault toilets, sheltered cookhouse, playground facilities, picnic shelters, hand water pumps, boat launch and a ramp and pier (with day use parking). While there is no officially designated beach area, the surrounding land has a very gentle slope with a good wet/dry beach. The lake is relatively shallow in this area. No municipal services are provided to the site; no shower facilities and no recreational vehicle hook-ups for power, water or sewage disposal. There are no areas designated for random camping and no outside trails have been developed for hiking, riding or ATV use. In 1986 Alberta Recreation and Parks introduced a user fee for overnight camping.

Alberta Recreation and Parks indicates that most of the people who camp overnight are from Edmonton. In 1988 they estimated that 32% of campground users were from Edmonton with only 6% from the local area. However, it was noted that day users are primarily from within a one hour drive of the lake. The 1988 survey also noted that campground visitors utilized the following:

Tents	- 17.5%	Campers/vans	- 27.1%
Trailers	- 33%	Motor homes	- 25.3%

In 1987 weekend camping occupancy was 33% with 16% occupancy during the week. In 1988 these figures dropped substantially to 24% occupancy on a weekend and 11% during the week. Alberta Recreation and Parks has indicated that the overall use of the area has been steadily dropping. Table 7 identifies camping/day use statistics for the past three years.

TABLE 7

CAMPING/DAY USE STATISTICS
LOWER MANN PROVINCIAL RECREATION AREA

Type of Use	1986/87	1987/88	1988/89	% Change since 1986/87 season
Occupied Campsite Nights[1]	2015	2120	1435	-32%
Day Use Parties[2]	2426	2775	1760	-35%

(Source: Alberta Recreation and Parks 1988)

1 This represents the number of times the campsite was occupied. Alberta Recreation and Parks uses a figure of 2.6 persons for each campsite night.

2 This represents the number of groups using the lake, i.e. a carload. In this case each party represents 2.5 persons.

Alberta Recreation and Parks notes that the decline in use could be the result of factors other than the quality of the recreational experience at the lake. They feel that the introduction of the user fee and the actual method for surveying could be affecting these figures. A 1985 user questionnaire indicated that the majority of visitors were satisfied with the lake environment.

4.3 User Survey (Appendix A)

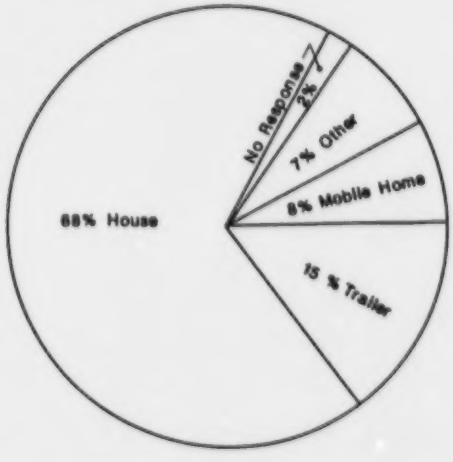
In November 1988 a land use survey was mailed to all property owners within the Planning Area. The survey was designed to provide specific information regarding land ownership and development. It also provided the residents with the opportunity to express their attitudes, perceptions and preferences regarding existing and future lake use. This information is regarded as a key element in the overall identification and evaluation of the development capability of the Mann Lakes.

A total of 348 surveys[1] were mailed with a return of 236, representing a response rate of 68%. The response rate is very high and indicates that there is genuine concern and interest by the property owners in the existing and future use of the Lakes. The survey results also noted a sense of urgency.

4.3.1 Residency Profile

A very large percentage(85%) of land owners are seasonal residents with 71% indicating they own a residential lot with an existing dwelling. Approximately 70% stated they have built a house or cottage with only 8% indicating they own a mobile home (figure 1).

FIGURE 1
RESIDENCY PROFILE



[1] There are approximately 540 registered titles within the planning area (excluding Crown land). This included all registered subdivision lots, farmsites and quarter sections. Many of these titles are held by the same owner. Only one survey was sent to the multiple land holders.

These figures indicate that the land owners are well established on their lots and the lakes are being highly used as opposed to being a speculative resort community. The high percentage of developed lots (25% of respondents indicated that while they owned land, they had not yet developed a residence) is indicative of a settled and established community.

Respecting seasonal use, the survey indicated that half of the respondents also utilized their lots during the winter. This figure is relatively high for a recreational lake where there are no winter recreational facilities. It does, however, suggest that there is excellent access to the site and that the driving distance from Edmonton or St. Paul is only a minor influence.

The majority of respondents noted that the pit toilet was the principle type of waste disposal system (61%) with only 16% stating they have a pump-out tank. The high percentage of pit toilet use indicates older developments and the fact that soil leaching into the lake could be a problem. This figure is a concern as many of the older subdivisions were approved without a reserve buffer between the lots and the lake.

4.3.2 Boating

Most respondents (85%) stated that they use some type of boat during their stay at the lake. Field surveys indicate that on summer weekends the lake is heavily utilized by motor boats and water skiers. Canoes and sailboats are less frequently utilized.

Boating problems, however, do not appear to be a major issue with the residents. While 71% did indicate that no new boat launch facilities should be built, 81% stated that there are no user conflicts between boat use and other recreational activities. There was, however, support noted for motor size control. Approximately half of the respondents felt that boating controls were necessary, (33% felt it should be unrestricted) particularly along residential shorelines.

4.3.3 Existing and Future Lake Use

The majority of lot owners (70%) felt that additional cottage development was not appropriate on the Mann Lakes. A larger majority (81% and 78% respectively) indicated that no additional public campgrounds and/or parks or commercial campgrounds and/or parks should be permitted. Respecting commercial development, 82% stated that no stores, gas stations or retail outlets should be permitted. It was

generally felt that such services were available in Ashmont and that permitting such a use would detract from the economic viability of the Hamlet. Approximately 75% stated that the Crown Land should be left in a natural state and not developed for any purpose.

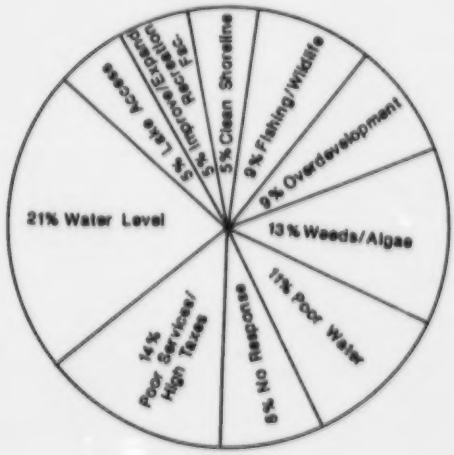
Overall, the land owners appear to like their lots and existing lake uses. Only 7% of the respondents felt that the beach areas or the lake itself were overcrowded and only 10% felt that the cottage sites were overdeveloped. Most owners appear to feel either indifferent or complacent with existing uses. As previously noted, the vast majority (81%) felt that there were no conflicts between existing lake uses.

4.3.4 Environmental Quality

The water quality of the lake, fluctuating water levels, and weeds are the main issues/concerns with all residents of the Mann Lakes. Approximately 80% of respondents felt that the current lake water quality was fair to poor with 53% indicating they felt it was getting worse. However, only 11% indicated water quality was the principle issue/concern.

The water quality problems were further identified through the concerns with excessive weed growth and fluctuating water levels. Problems with algae and weed growth were identified by 70% and 84% of the respondents, and 13% identified this as the principle issue/concern. The respondents further noted that shoreline aquatic vegetation, a polluted and messy shoreline and mud beach were serious concerns (75%). Fluctuating water levels, however, is the principle issue. Approximately 21% of all respondents noted this as the most serious concern (Figure 2).

FIGURE 2
PLANNING ISSUES/CONCERNS



The water quality, water levels and aquatic vegetation control are interrelated and the residents indicated that these problems should be dealt with through joint action.

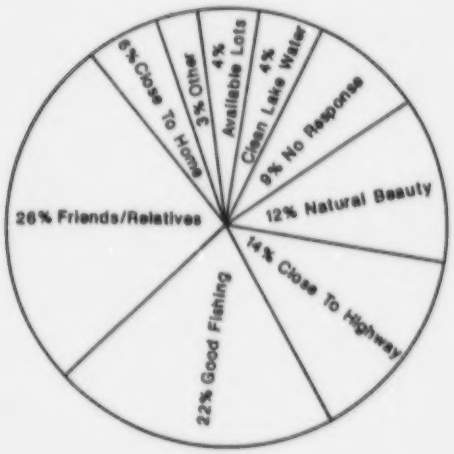
As a final note, fishing was indicated as a principle concern by only 9% of the respondents. While 36% indicated fishing was a problem, only 11% stated that they chose these lakes because of the fishing potential.

4.3.5 General Comments

One of the questions asked in the survey related to the reason each respondent had for locating at Mann lakes, (Figure 3). The majority response (26%) was that friends and relatives had already purchased a lot on the lakes.

In relation to the age of the subdivisions (the last multi-lot subdivision was approved in 1981) the number of developed cottage lots (68%) and the concern over the deteriorating quality of the lake environment (78%), it is possible to assume that the majority of respondents are very concerned that the environmental deterioration of the lake could affect both their existing social community and the value of their property. In this manner all residents feel that the lakes should be protected and efforts be undertaken to prevent further problems.

FIGURE 3
LOCATION FACTORS



5.0 LAKE DEVELOPMENT CAPACITY

5.0 LAKE DEVELOPMENT CAPACITY

Based upon an evaluation of the resource inventory, the development capacities of Upper and Lower Mann Lakes planning area can be identified. The development capacity is evaluated in terms of the lakes' capability to support existing and future development. This involves an assessment of the geophysical, biophysical and land use limitations to development.

5.1 Geophysical Limitations to Development

Three components of the geophysical resources play key roles in determining the capability of the lakes to support development: the topography, the drainage area and lake bathymetry (Map 11).

The overall rough topography of the planning area severely limits the land available for development. Average slopes are moderately (9%) to strongly (15%) rolling with gentler slopes (5%) mostly occurring in the backshore. Generally, soils are considered to have a slight erosion hazard on level to gently undulating topography and severe erosion hazard on slopes greater than 9%. This results in increased surface runoff causing slope destabilization and lake siltation and eutrophication.

The Orthic Grey Luvisols, dominant throughout the planning area, have only slight development limitation for dwellings when located on favorable topography (slopes less than 9%).

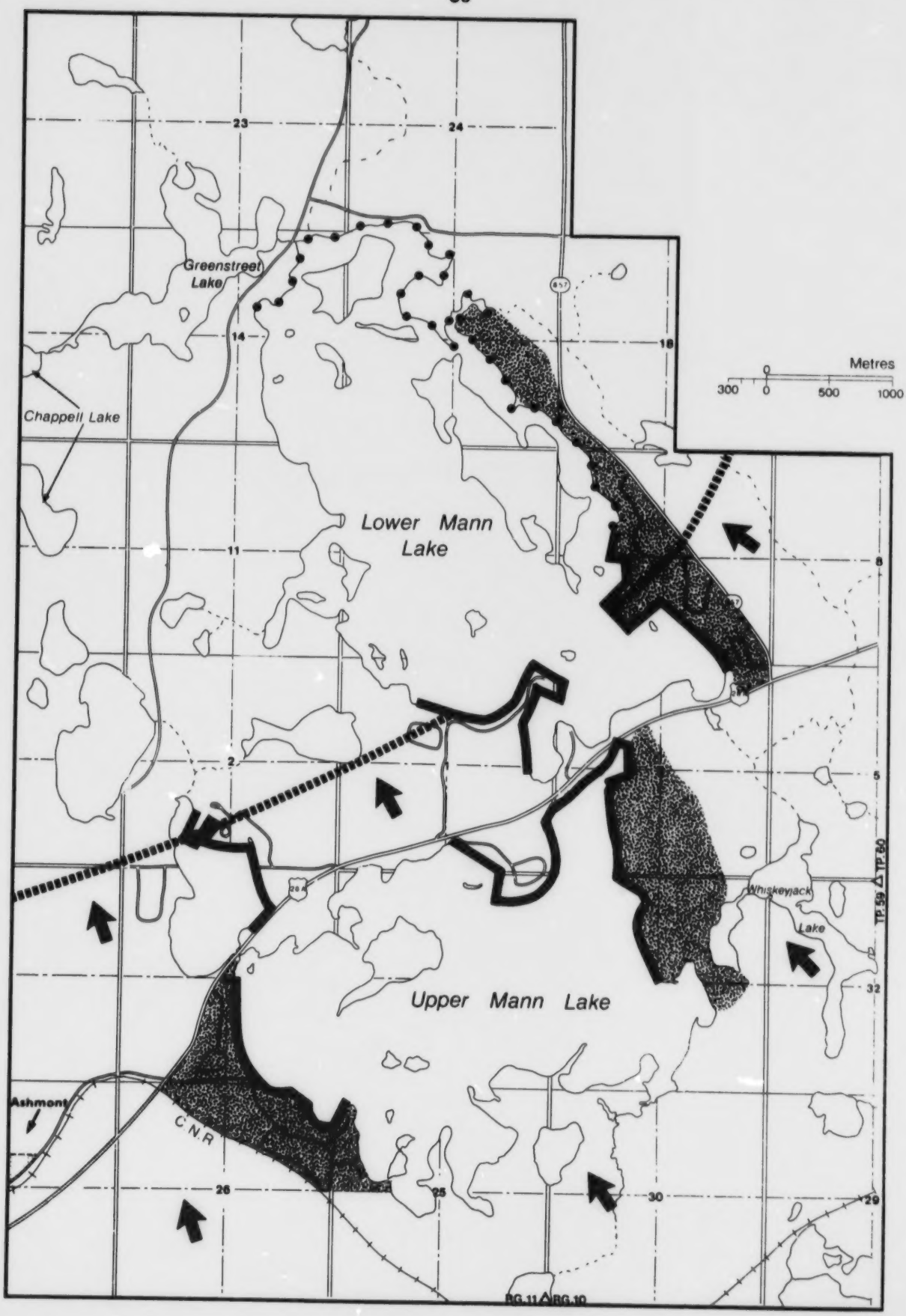
The Mann Lakes watershed plays perhaps the most important role in evaluating the development capabilities and limitations in the planning area. No streams feed or drain the lakes, making them entirely dependent on surface run off and precipitation to replenish the water levels, (Table 2). This factor is further exacerbated by the extensive area identified as dead storage (Map 4). Consequently the lake levels rise and fall according to each year's weather pattern.

The fluctuations in water levels affects all aspects of development. In years of above average precipitation surface run-off can raise water levels resulting in flooding; specifically along the northern shore of Lower Mann. In 1977, following local complaints about serious flooding in the northern portions of the planning area, Alberta Environment built a weir between Greenstreet and Chappell Lake (Map 4). The objective was to maintain water levels on the Mann Lakes at a constant level. Overflow would only occur when the lakes were at their maximum height. However, since the weir was completed in 1983, the lakes have not risen to expected levels and insufficient precipitation has resulted in the weir channel between the two lakes being dry.

The periodic low volume of freshwater also results in low throughput[1] for each lake. This results in minimal flushing actions which would tend to remove some of the excess nutrients. There is currently no surface flow from Upper to Lower Mann nor Lower Mann through to Greenstreet Lake. Consequently there is a small dilution factor for the amount of nutrients entering the lake.

Finally, the wide fluctuations in water levels and the general physical shape of the lakes, affects recreation activities. Decreased water levels expose greater areas of shorelines and boating and swimming facilities are simply left high and dry. The irregular shape of the lakes also results in many stagnant bays which receive little or no flushing action. These areas become clogged with aquatic vegetation and are inaccessible for boats or any other recreation activities. Fish, which spawn in shallow water, may also be affected by shallower water as their habitats become either exposed or filled with silt.

[1] The throughput indicates the amount of water flowing into and out of each lake as the water drains in the Beaver River.


Greenstreet Lake
Chappell Lake
Lower Mann Lake
Upper Mann Lake
Whiskeyjack Lake
Ashmont
C.N.R.
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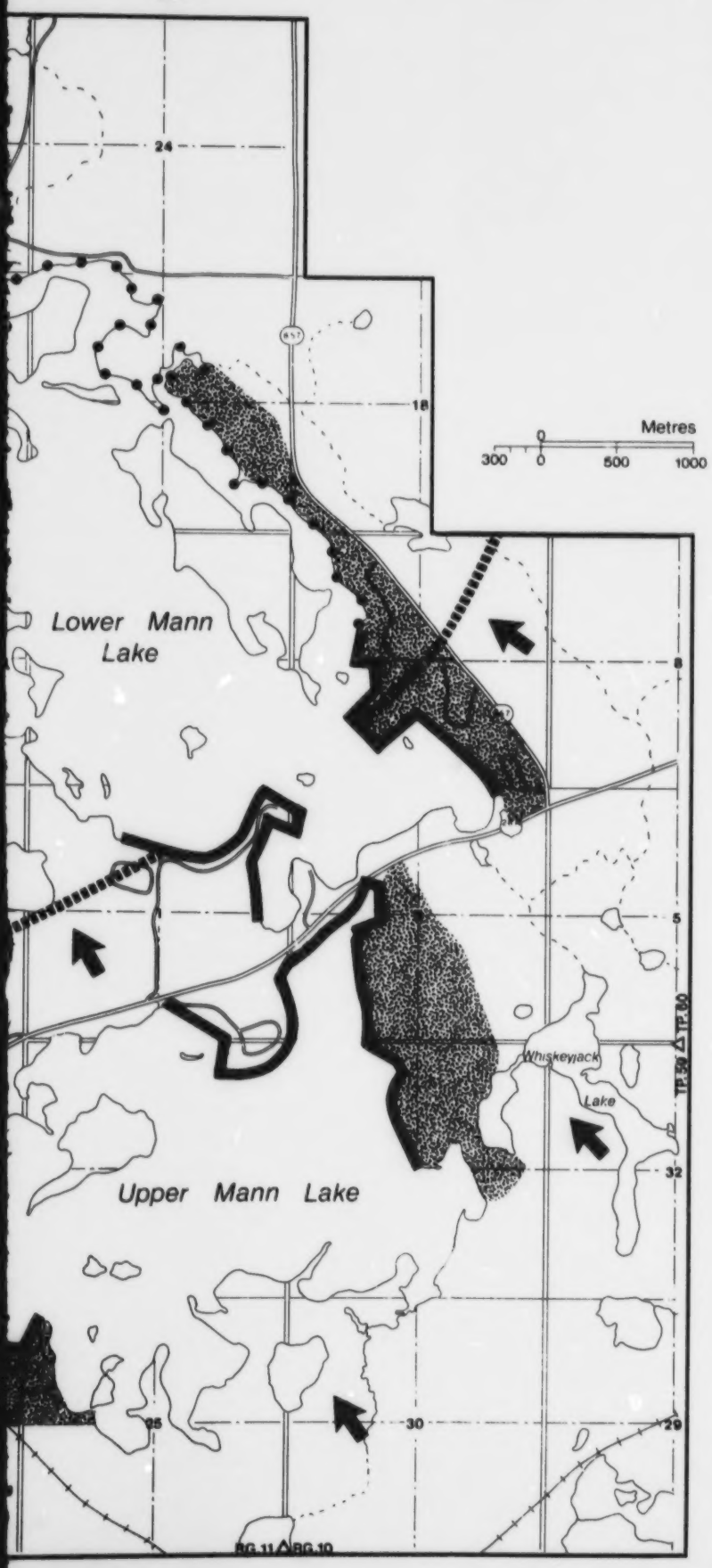
UPPER & LOWER MANN LAKES

MAP 11
Geophysical Development Constraints



- Key Watershed Area
- Steep Shoreline
- Strongly Rolling Backshore
- Gentle Shoreline

Source: Alberta Municipal Affairs, 1988

5.2 Biophysical Limitations to Development (Map 12)

The deteriorating quality of the lake environment is undoubtedly the most serious limitation to the existing and future recreational use of the Mann Lakes. This biophysical aspect involves lake water quality, shoreline aquatic vegetation and the fisheries habitat.

Alberta Environment has stated that Upper Mann is eutrophic and Lower Mann is hyper-eutrophic. This indicates excessive nutrient levels in the water resulting in an overall deterioration of the water quality. Problems with excessive aquatic vegetation growth, smelly and murky water, summer algal blooms, muddy shorelines and fish winterkill are evident for both lakes.

The causes of water quality deterioration are many and cannot be blamed on any one source. Local agricultural practices do contribute nutrients to the lakes. Existing cow/calf operations permit cattle direct access to the lake and the poor natural fertility of the soils requires nitrogen fertilizer applications. In both circumstances nutrients from animal wastes and agricultural run-off enter the lakes.

Tree cover removal for either crop production or recreational development also contributes to water quality reduction. Cleared slopes are highly susceptible to erosion, thereby increasing the amount of sediment entering the water. Further, the vegetative uptake of nutrients from the soil run-off is greatly reduced. This is a particular problem on Mann Lakes due to the steep shoreline slopes and heavy concentration of shoreline development. Within the residential areas substantial stands of trees and brushes have been cleared along the shoreline.

The physical characteristics of the Mann Lakes are such that they cannot sustain a high nutrient input without suffering considerable water quality degradation. The limited inflow greatly restricts the ability of the lakes to cleanse themselves. When the lakes are not flushed by a steady throughput nor diluted by a sufficient source of freshwater, the nutrient levels continue to rise. Other factors such as lake shallowness, limited water surface mixing through wind and wave action, the irregular shoreline and lake contours also influence eutrophication by decreasing the dissolved oxygen content.

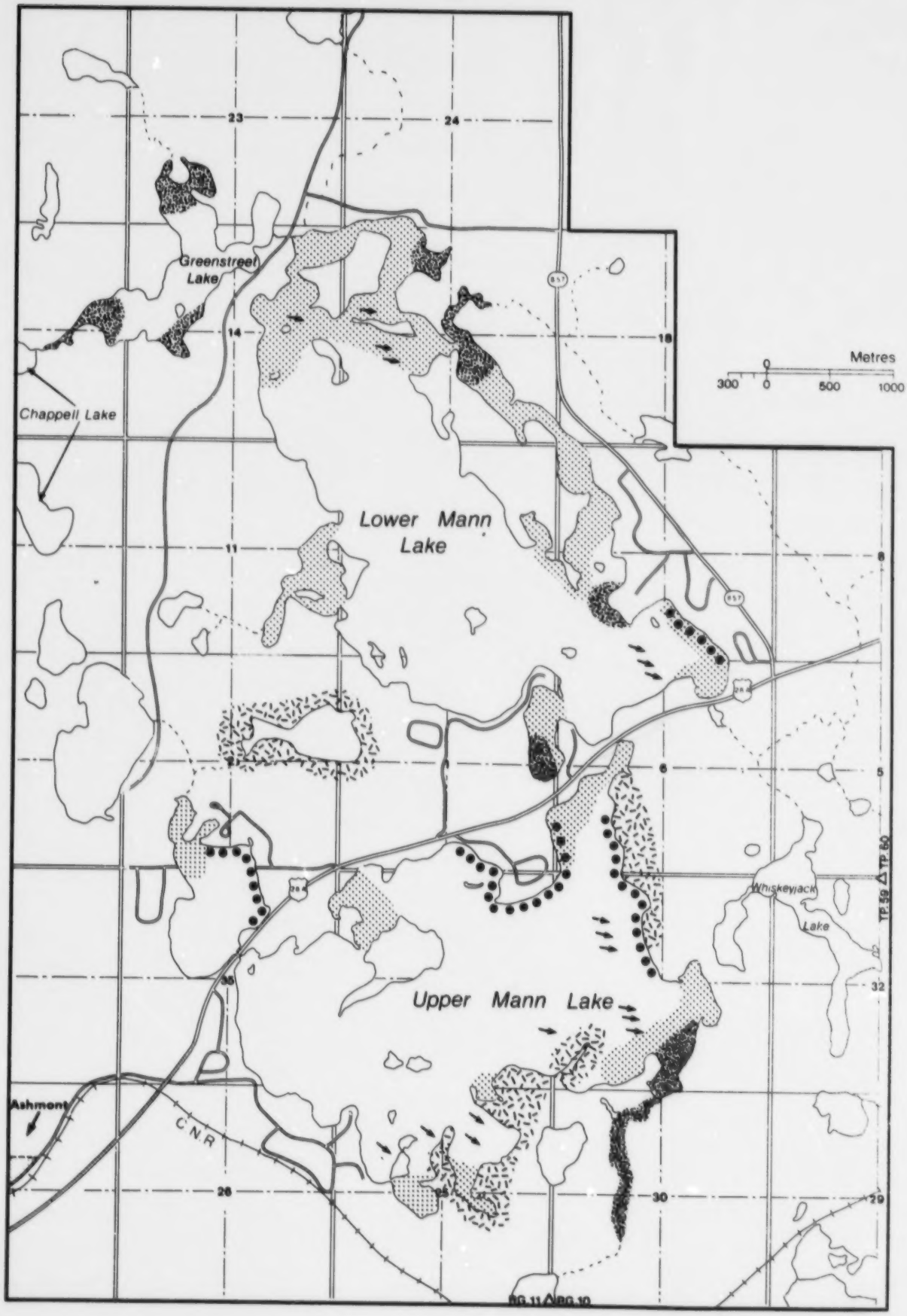
As the water quality deteriorates, the lakes become less appealing for recreational use. Swimming and boating are deterred by the excessive aquatic vegetation and the summer algal blooms. The sport fishery is also affected as winterkill depletes stock and prevents improved catches.

5.3 Land Use Limitations to Development

The majority of respondents to the land use survey indicated that the environmental deterioration of the lake was their primary concern. The respondents believed that this issue must be addressed to improve the physical environment and prevent further damage. It was generally believed that the recreational attractiveness of the lakes and the quality of the recreational experience were in decline and that they were either going to start selling their land or simply cease visiting the area. Several respondents to the land use survey noted that while they wished to sell their lots, there were no buyers.

5.3.1 Land Use

Social limitations to existing and potential development essentially relate to the quality of the recreational experience at the lake. User satisfaction, perceived levels of development and concern respecting the quality of the lake environment are valuable indicators of the type and density of development acceptable on the lake. Previous studies undertaken by Alberta Municipal Affairs in northeastern Alberta have clearly demonstrated that as lake use increases, the percentage of users perceiving the quality of the recreational use to be in decline, will also increase.


Greenstreet Lake
Chappell Lake
Lower Mann Lake
Upper Mann Lake
Whiskeyjack Lake
Ashmont
CNR
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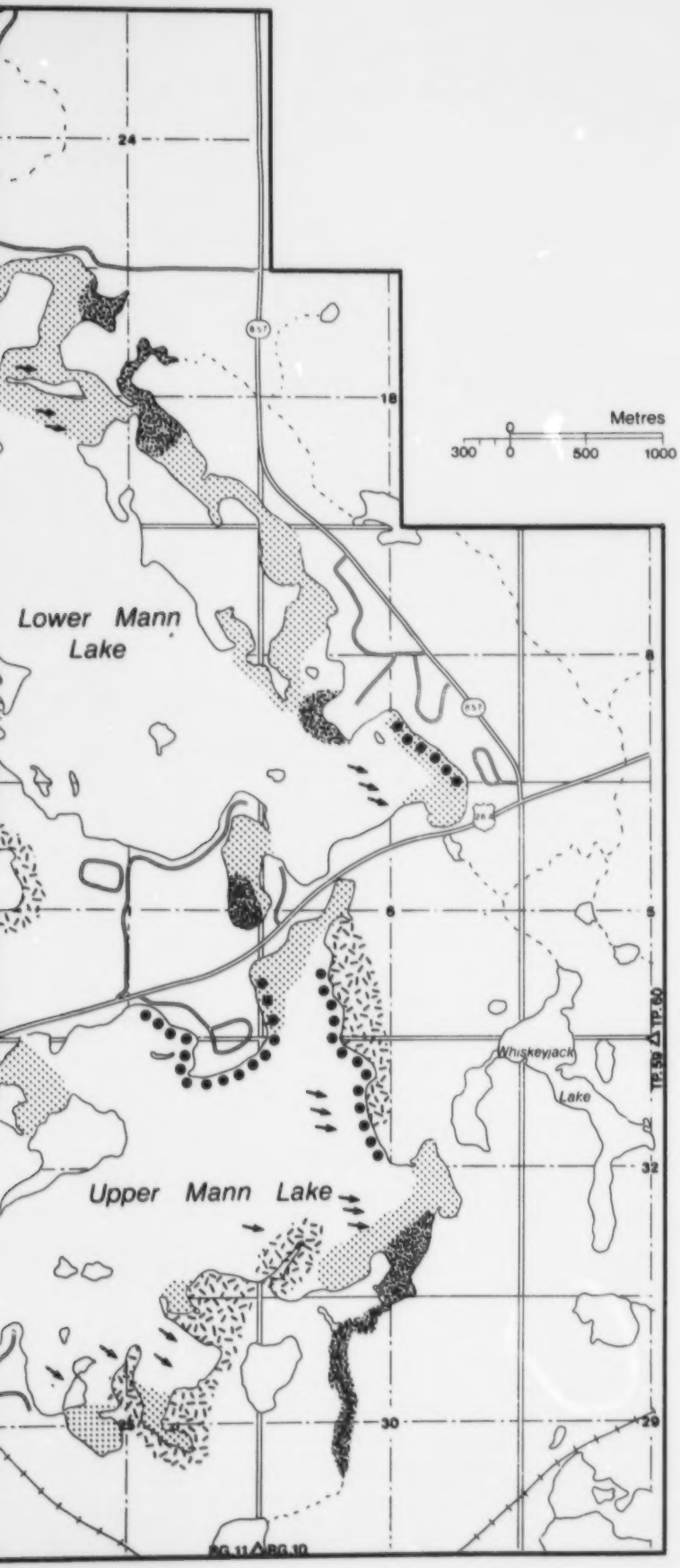


UPPER & LOWER MANN LAKES

MAP 12
Biophysical Development Constraints

- Sensitive Spawning Areas
- Extensive Shoreline Aquatic Vegetation
- Steeply Sloping Wet/Dry Beach Area
- Sensitive Wildlife Areas
- Fetch (Prevailing Wind)

Source: Alberta Municipal Affairs, 1988

Alberta Municipal Affairs has assumed that the maximum acceptable density for full recreational enjoyment on a lake is between 3 to 4 hectares of surface water for every residential lot. Once the level of lake development occurs below these figures, the majority of the lake users will perceive that the lake is overused. (Source: Alberta Municipal Affairs, Planning Services Division).

There are a total of 485 registered subdivision lots on both lakes of which 226 contain a residential development: Considering only the number of developed lots, 4 ha of lake surface area is available for each user on Upper Mann and 8 ha on Lower Mann, (Table 8). However, if all available lots were to be developed, these figures decrease dramatically to 2 ha per user on Upper Mann and 3 ha per user on Lower Mann.

TABLE 8

RESIDENTIAL LAKE USE STATISTICS

	Lake Surface	Registered Residential Lots	Developed Residential Lots	Undeveloped Residential Lots
Upper Mann	604 ha	288	148	140
Lower Mann	608 ha	197	78	119

	Lake Surface Area Per Registered Lot	Lake Surface Area Per Developed Lot
Upper Mann	2 ha	4 ha
Lower Mann	3 ha	8 ha

Another method of evaluating lake capacity is to consider the day/overnight use of the provincial recreation area. According to Alberta Recreation and Parks, on an average weekend during the summer months, there are approximately 63 day use party visits and 78 occupied campsite nights[1]. It can, therefore, be assumed that on each day of a weekend in July, there are approximately 85 day users and 133 overnight campers.

[1] A day use party visit refers to lake users who do not stay overnight but who utilized park facilities. In the case of Lower Mann Lake, each day use party visit consists of 2.7 persons. An occupied campsite night refers to the use of the 70 overnight camping stalls. Each campsite night consists of 3.4 persons. (Source: Alberta Recreation and Parks)

An estimate of total day use (weekends at full capacity) can also be calculated. The results suggest that on an average weekend in July, assuming full occupancy, approximately 964 people are using the Mann Lakes. By dividing the total lake surface area for both lakes (1212 ha) by the number of users (296) an estimate of total lake density can be calculated. Present use levels would yield a ratio of 4 ha/user. When all existing lots are developed, the ratio will drop to 2 ha/user. (Appendix B presents a complete breakdown of all statistical data).

Utilizing the fact that overcrowding and user dissatisfaction is perceived to occur once the unit density is reduced to approximately 4 ha/user, it can be assumed that the Mann Lakes are rapidly reaching a state of overcrowding and declining recreational potential. The figures also illustrate that total lake use could double without permitting any additional residential or recreational development.

5.3.2 Boat Use

Evaluation of the recreational use of the lakes for boating involves identification of boat density capability. This compares the number of boats utilized by the existing property owners and recreational users with the amount of water surface available for boating[1]. An average of 4 ha of surface water is required per boat to avoid congestion.[2] On the Mann Lakes, the survey indicated approximately 85% of residential lot owners owned a boat. Utilizing this figure to represent total boat usage for developed lots, it is assumed that approximately 126 boats could be used on Upper Mann and 66 boats used on Lower Mann. On Upper Mann, each boat would have approximately 4 ha of lake surface and on Lower Mann each boat would have 6 ha of lake surface.

[1] The water surface of the Mann Lakes available for boating was identified by eliminating areas inaccessible or unuseable by boats due to shoreline configuration. For Upper Mann, the surface area available for boating is approximately 475 ha and or Lower Mann, the surface area is approximately 410 ha.

[2] Alberta Recreation and Parks methodology.

Adding the number of boats used at the provincial recreation area, the total figures indicate that both lakes are at or near their boating capacity. If all of the vacant residential lots were developed, neither lake would be able to accommodate the type of future development which would generate additional boating activities. Table 9 outlines the data used in this evaluation (refer to Appendix C for further explanation).

TABLE 9

BOAT USE[1]

	Boats Owned by Property Owners	Lake Surface Area Available for Boating	Surface Area Available for each Boat owned by Property Owners	Boats Operated from Provincial Recreation Area (at capacity)[2]
Upper Mann	126	475 ha	3.8 ha	-
Lower Mann	66	410 ha	6.2 ha	18

	Total Surface Area Available for Boating	Actual Utilization Level (20%)	Potential Boat Use from all Residential Lots	Total Surface Area Available for Future Boating (including recreation area)
Upper Mann	3.8 ha	19 ha	245	1.9 ha
Lower Mann	4.9 ha	24 ha	167	2.2 ha

[1] The number of boats operating from the municipal boat launch on Upper Mann Lake is unknown. All figures represent only statistics available for residential lots and the provincial recreation area.

[2] When water levels are higher it is possible to move from one lake to the other through connecting culverts. However, recent low levels prohibits this movement. Therefore, the boating use generated from the provincial recreation area is restricted to Lower Mann Lake

Alberta Recreation and Parks has estimated that at any given time period during peak summer weekend use, there is a 20% actual utilization level. This means that only 20% of available boats are actually on the water at the same time. Utilizing this estimation, boating congestion would not appear to be a problem. However, this calculation does not consider the type of boating, (fishing, water skiing, leisure boating) the lake surface roughness, patterns of localized boating and lake shape or depth.

Generally, the overall irregular shape of both lakes is not conducive to intensive boating or water skiing activities. The shallow shorelines, numerous bays and islands and the extensive areas of weeds and surface algae, greatly inhibits and in some areas restricts boating and water skiing. Most of the boating activities occur along the developed shorelines or in the central basins of each lake. Excessive amounts of boating in these areas, especially near the public boat launching facilities, could result in navigational problems and inhibit beach activities. The landowners indicated concern with respect to water skiing activities occurring too close to developed shorelines.

A further problem results when congestion occurs on the more open areas and boaters begin utilizing the undeveloped shorelines and the bays and inlets. Motor boats in these shallow waters stir the bottom sediment damaging fish habitats and releasing nutrients stored in the bottom mud into the overlying water.

Overall, boating pressure from existing developments and the provincial recreation area appears to be less than the lakes' capacity to accommodate their use. However, both lakes have an extremely limited capacity to permit increased power boating activities.

5.3.4 Crown Land

Approximately 25% of the land in the planning area is Crown Land, owned by the Province of Alberta and administered through Alberta Forestry, Lands and Wildlife. Most of this land is unpatented and utilized by the Department for fish and wildlife protection and habitat enhancement. Along the south and eastern shore of Upper Mann Lake, a Buck for Wildlife program has been established to prevent agricultural use and protect the environment. The large island in Upper Mann is also utilized for fish and wildlife enhancement. The balance of land is leased to area farmers under grazing leases or permits. This allows the lessee to use the property for agricultural and livestock purposes.

The land use survey indicated that 75% of the respondents felt this Crown Land should be left in a natural state. They noted that with the amount of shoreline development, the Crown land provided both a buffer between land uses and a natural park area.

6. CONCULSIONS ASSESSMENT AND RECOMMENDATIONS

6.0 CONCLUSIONS, ASSESSMENT AND RECOMMENDATIONS

The major geophysical and biophysical development constraints and limitations within the planning area have been summarized on Maps 11 and 12 and on Table 10. The conclusions, assessment and recommendations which follow are based upon this information as well as the socio-perceptual limitations identified through the survey. The conclusions lead to an assessment of existing lake use and potential development opportunities. The recommendations provide a guideline towards establishing long range planning policies. Map 13 identifies the potential development opportunities.

6.1 Conclusions

6.1.1 Geophysical (Map 11)

a) Average slopes around to Mann Lakes are predominantly rolling (9-15%) with steep banks and generally rough terrain. With limited areas of gentle backshore or shoreline slopes, the topography generally restricts development.

b) The soil properties indicate that the land is well drained and generally suited for residential and recreational development. The problem, however, is that with such steep slopes, soil erosion, slumping and lake siltation is a major concern.

c) Groundwater supplies within the region appear adequate. The quality of the water is generally suitable for human consumption. There should be no concerns if and when good quality water is required.

d) The watershed is very important to the overall development capability of the lakes. The poor drainage system and a dependency on precipitation and surface runoff greatly affects the inflow and outflow of both lakes. The water levels, water quality, fish and wildlife habitats and the general enjoyment of both lakes are totally dependent upon the yearly weather patterns.

e) The lake levels are currently perceived to be at historic low levels due principally to unseasonally low precipitation. Beaches are exposed to wave action, fish and wildlife habitats dry up, water quality deteriorates, submergent and emergent vegetation clog shallow bays and inlets and residential piers and docks are left high and dry.

f) The Mann Lakes are characterized by an irregular shoreline with numerous bays and inlets. These areas are shallow and well protected from wind and wave action. This result in excessive growth of submergent and emergent vegetation. Overall, however, the shoreline contours are conducive to recreational use and development. There are numerous areas of gentle shoreland and good littoral zones. These areas are, however, restricted for use by the excessive aquatic plant growth.

6.1.2 Biophysical (Map 12)

a) The Mann Lakes contain extensive areas of aquatic vegetation and shoreline marshes. There is also an a expansive summer algal-bloom on both lakes. The extensive submergent and emergent vegetation growth is indicative of nutrient overloading and declining water levels resulting in eutrophication and deteriorating water quality. The aquatic vegetation has clogged almost the entire northern and northeastern shoreline of Lower Mann and greatly restricted to development potential of the eastern and southern shoreline of Upper Mann Lake.

b) Alberta Environment classifies Upper Mann Lake as eutrophic and Lower Mann Lake as hyper-eutrophic. Nutrients released into the lake through agricultural runoff, livestock waste and shoreline clearing have resulted in deteriorating water quality, excessive aquatic vegetation growth and algal blooms. The lakes also have an extremely poor flushing period and water entering the lake will remain for abnormally long periods of time. The result is that the Mann Lakes have become extremely fertile. These conditions give the lakes a murky appearance and create a less attractive environment for recreational activities.

c) The Mann Lakes have had a serious decline in fish populations in recent years. Low water levels, lake siltation and eutrophication have resulted in habitat destruction and severe winterkill. Alberta Forestry, Lands and Wildlife has attempted to protect both fish and wildlife habitats through the Buck for Wildlife program. This program has restricted the use of Crown land around the lakes.

d) The recreation potential for the Mann Lakes is low according to the Canada Land Inventory. The CLI notes that the majority of shoreland is suitable for recreational use but only for minor intensities. Overall, the topography, and steep shoreline restricts the recreational potential of the areas.

6.1.3 LAND USE

a) The survey indicated that the primary concern/issue of the residents is the deteriorating natural environment of the lakes, specifically: water quality, weed growth and fluctuating water levels. Several residents were so concerned that they were going to sell their property. Respecting future development, the majority of residents felt that no further development should be permitted and that the Crown Land should remain in a natural state.

b) Field research, input from government officials and the County of St. Paul indicated that lake use was very high during the summer months. Alberta Recreation and Parks noted, however, that use of the recreation area on Lower Mann Lake has dropped 35%. The reasons for this decrease are uncertain. However, they indicated that the deteriorating environment could be the principle cause.

c) Calculation of the lakes' development capacity indicated that with existing development both lakes are at or near full capacity. This conclusion is further complicated by the fact that as the balance of existing registered lots are developed, ovreall lake use will double.

d) Calculations of the lakes' boating capacity indicated heavy boating use by the residents. The capacity for both lakes is at or near the maximum and with development of the vacant lots, boating congestion would be a serious concern. The problem of too many boats is complicated by the fact that the irregular shape of both lakes and the heavy shoreline vegetation growth restricts the lake surface area available for boat use.

e) There is limited Crown Land within the planning area. This places an increased value on the existing Crown Land, especially adjacent to the lakes. Lakeshore Habitat Protection Notations have been posted on all vacant Crown Lands allowing no surface disposition without Alberta Fish and Wildlife consent. Grazing leases are being

monitored to reduce or eliminate shoreline damage and nutrient loading. Crown land on the eastern and southern shore of Upper Mann Lake is currently used by the Crown in their Buck for Wildlife program.

f) Field research and comments from the residents and the County of St. Paul indicated that many residents have cleared their lots of all or part of existing vegetation and reshaped portions of the shoreline to support improved beach access. Because of the steep slopes throughout most of the residential areas, these lots are highly susceptible to erosion. Clearing promotes lake siltation and nutrification.

g) The topography restricts the agricultural use of land within the planning area to pasture and grazing. There are several cow/calf operations adjacent to the lakes and cattle are permitted direct access to the lake. The low soil fertility in the area also requires the heavy use of chemical fertilizers.

6.2 Assessment (Map 13)

An overall assessment of the development capabilities of Upper and Lower Mann Lakes indicates that neither lake is currently capable of supporting future recreational or residential development. The information provided in this report indicates a rapidly deteriorating lake environment that could severely jeopardize existing and future development opportunities. Therefore, no additional recreational or residential subdivisions should be approved until such time as the environmental quality of the lakes is improved, lake levels stabilized and all existing vacant residential lots have been developed.

Based upon this assessment, the following evaluation of the lakes development capabilities is provided: (Map 13 identifies those areas with development potential and limitations and Table 10 provides a chart of overall development capabilities).

a) Areas of steep slope and rolling topography should be protected against any development. The potential for lake water contamination from uncontrolled erosion along these shorelines is very high.

b) Vegetation removal in areas of existing development should be prohibited. Increased nutrient loading of the lake from surface erosion will increase the already excessive aquatic plant growth.

c) Due to the poor drainage pattern both lakes suffer from a lack of surface inflow and outflow and lake levels are primarily dependent upon precipitation for water renewal. While the lake levels will continue to reflect seasonal weather patterns land use which would interfere with the natural surface flow should be prohibited.

d) The slow flushing period of the lakes, the high water residency time, the unseasonably low precipitation levels and the increased nutrient fertilization all contribute to eutrophication. Excessive aquatic plant growth, summer algae-blooms, murky and smelly water, low fish populations and a general decline in the recreational enjoyment of the lakes has resulted from the poorer water quality. If the nutrient loading is not reduced, the water quality and the natural lake environment will continue to deteriorate.

e) The numbers of existing undeveloped lots on both lakes plays an important role in determining the development capability. All new development on these lots should be controlled with respect to their effect on the environment and existing uses.

f) It is important to protect and where possible, enhance fish habitats. The entire bed and shore of the lakes are sensitive. The Mann Lakes are already eutrophic to the limit of fish survival, as is evidenced by the frequent severe winterkills.

g) The residents have identified the deteriorating environmental quality of the lakes as their principle concern. They feel that this issue must be addressed to prevent future deterioration. The questionnaire results indicated that several residents were considering selling their property because the lake is no longer useable.

h) The Mann Lakes are heavily used by power boats and water skiers, especially during summer weekends. These boats often interfere with each other and with other recreational activities. They also contribute to the deteriorating water quality by stirring sediment in shallow areas and destroying shoreline nesting and spawning habitats. Due to the irregular shoreline, the shallow bays and inlets should be protected from power boat use.

i) The Crown Land currently being used for fish and wildlife habitat protection and enhancement should remain under the Buck for Wildlife program. This program also prevents cattle from direct access to the lakes. The Crown Land on the eastern shore of Lower Mann should be left in its natural state to prevent increased erosion and nutrient loading and to protect the watershed.

j) The high response to the land use survey indicated a sense of urgency on the part of the residents to the environmental deterioration of the lakes. Their responses also indicate a pessimistic view on future use unless something is undertaken to prevent future environmental damage. The large number of residents, their obvious concerns for the lake and their desire to be involved in any future development plans, should encourage the County to prepare specific long range planning policies and guidelines.

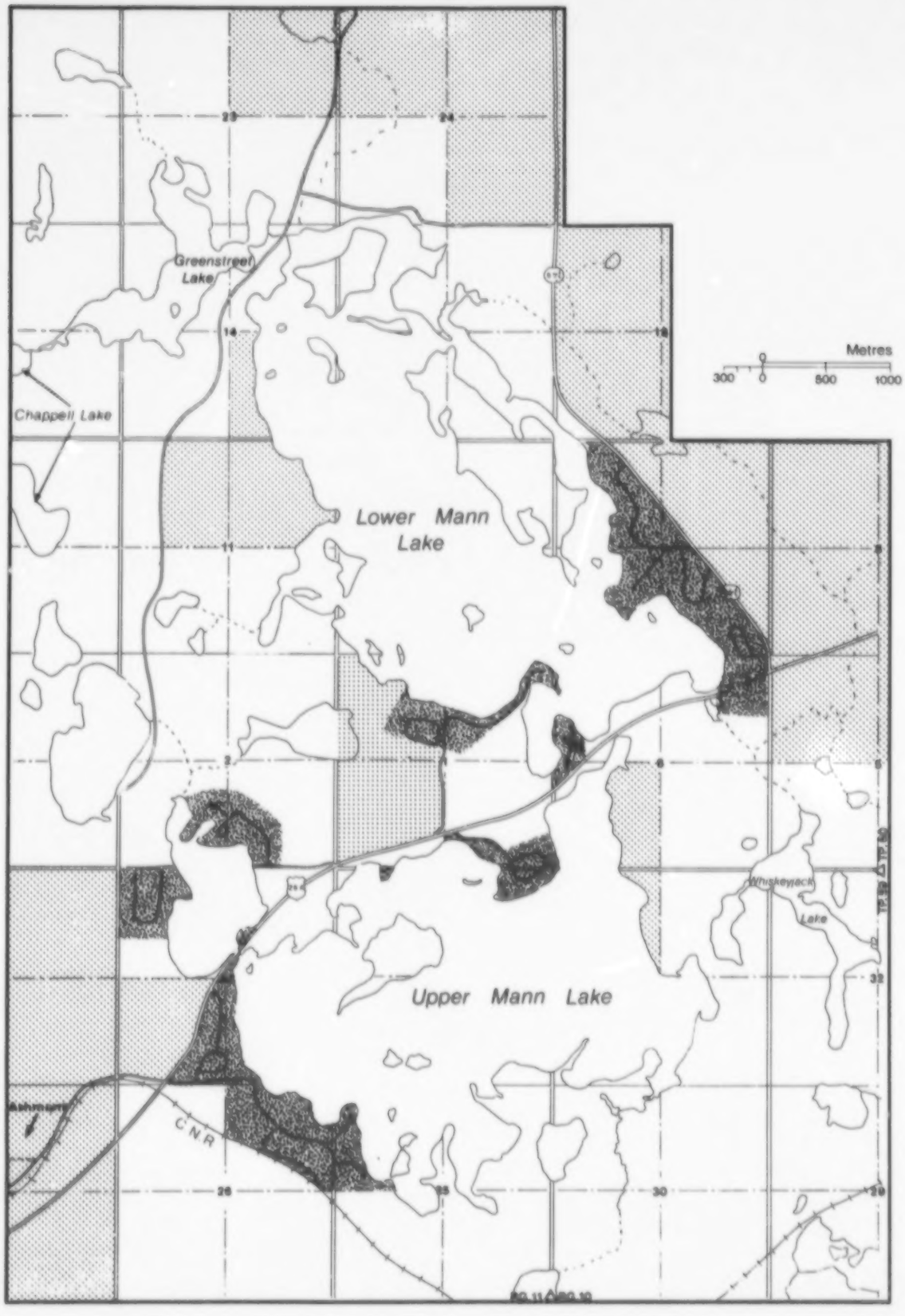
Table 10

ASSESSMENT CHART FOR
RECREATIONAL/RESIDENTIAL DEVELOPMENT LIMITATIONS

LEGEND

- None
• Moderate
X Severe

1) Geophysical Resources	Topography	Vegetation	Soils	Drainage System	Groundwater	Water Levels
	X	-	-	X	-	X
	Water Table	Shoreline Char.	Beaches	Bathymetry	Erosion	Flooding
	-	-	•	•	X	•
2) Biophysical Resources	Water Quality	Aquatic Vegetation	Algae	Fish Habitats		
	X	X	X	X		
	Wildlife Habitat	Water Sediment	Sewage Disposal			
	-	X	•			
3) Land Resources	Boating Capacity	Provincial Recreation Area	Boat Launching Facilities	Lake Access		
	•	-	-	-		
	Municipal Reserves	Residential Attitude Towards Development	Development Capacity			
	-	X	X			



UPPER & LOWER MANN LAKES

MAP 13
Development Assessment

- Developed Areas
- Development Constraint Areas
- Development Potential Areas

Source: Alberta Municipal Affairs, 1988

6.3 Recommendations

Based upon the assessment of the lakes' development capabilities and limitations, a list of recommendations have been prepared that would protect the lakes' from overdevelopment and continued environmental deterioration. The recommendations are designed to improve existing and potential recreational uses and are the central focus in determining long range planning policies and guidelines for Upper and Lower Mann Lakes.

1) No new construction or development should be permitted within 30m of the lakes' high water mark.

2) Recreational development should locate only within those areas identified on Map 13 as having development potential.

3) No development shall be permitted within 30m of areas identified as important fish and wildlife habitats (Map 12).

4) Retain natural vegetation within 100m of the shoreline (high water mark) and within the watershed as described on Map 11.

5) Protect fish spawning habitats by creating non-boating regulations within the critical shoreline areas (Map 12) and;
   - encourage fish stocking,
   - prevent increased water fertilization,
   - a minimum 100m buffer shall be created for all significant spawning areas, and
   - apply more restrictive regulations on fishing the lakes in winter and summer.

7) No commercial development should be permitted.

8) No intensive livestock operations should be permitted within the planning area.

9) No new multi-lot development proposal should be permitted until such time as existing vacant lots have been developed.

10) The municipalities should examine the sewage disposal systems installed in the existing developed residential areas. If the municipality decides that the sewage disposal systems have become injurious or dangerous to public health, the municipality should request the local health unit to investigate such situations with a view to requiring, under the Public Health Act, corrective measures, if necessary. Where any person fails to undertake the prescribed corrective measures, the municipality should undertake such measures with the costs incurred to be collected in like manner as municipal taxes.

11) Any future development or structures (except for removable domestic piers or removable boat lifts) proposed on the shoreline reserve or lake bed should be required to obtain authorization from Alberta Forestry Lands and Wildlife (if on the lake bed) and/or a development permit from the municipality (if on the shoreline reserve). Alterations to the bed and shores of Mann Lake should not be undertaken without the necessary authorization and permits from the appropriate government agencies.

12) The County of St. Paul upon request from area residents, may apply to the Alberta Boating Regulation Review Committee for the imposition of appropriate boating regulations in specific locations of the lake. Water preservation zones to protect swimming areas and to conserve habitats are recommended.

13) Upon receiving the approvals from the Alberta Boating Regulation Review Committee, the County shall post and maintain signs in appropriate locations informing the public of the boating regulations.

14) Restrict use of fertilizers within 300m of lake shore.

15) Restrict cattle access to the lake.

16) The County shall encourage the use of Crown Land for fish and wildlife habitat protection and that these lands remain in a natural state. No sale of Crown Land adjacent the lakeshore should be permitted.

17) Water quality should be monitored thoroughly and regularly to evaluate the present condition of the lakes, to detect changes and recommend solutions. Specifically, the effect of agricultural fertilizers, cattle grazing and sewage disposal should be monitored to determine the effects of nutrient loading.

18) Proper reclamation and revegetation programs should be implemented throughout developed and undeveloped areas.

19) The first priority for future recreational development shall be public use.

20) No development and restrictive boating regulations within 100 m of the cormorant nesting areas.

7. PUBLIC MEETING SUMMARY

7.0 PUBLIC MEETING SUMMARY

A public meeting was held June 3, 1989 in Ashmont to discuss the information contained in the Background Study and to discuss future planning and development on the Mann Lakes. Approximately 110 land owners attended as well as representatives from the County of St. Paul and Alberta Environment.

The following is a summary of the comments made during the meeting. The items were discussed in relation to nine topics derived from question 20 of the Land Use Survey.

ISSUES OF GREATEST CONCERN

1. Water Levels

   a) Can water levels be increased?

      Water levels are the result of poor rainfall amounts over the past few years and not the result of withdrawls for Hamlet use

   b) Does the weir on lower Mann affect water levels?

      Only during periods of high water levels where flooding may occur along the north boundary of Upper Mann Lake. The weir has no impact on the lakes during periods of low water levels

   c) Are water levels decreasing because of the various heavy oil sands projects in the area?

      While a definite answer was unknown it was generally believed that drought was the main problem.

2. Poor Municipal Services/High Taxes

   There was no representation from the County Council present at the meeting. The administrative staff felt that questions on taxation should be answered in a meeting with the County Council.

3. Weeds/Algae

   a) Can the land owners use chemicals (copper sulphate) to remove weeds from beach areas?

      It was noted that copper sulphate (often referred to as 'bluestone') is not registered for use in surface waters. The Pesticide Management Branch of Alberta Environment issues permits for liquid herbicides, such as Reglone A for shoreline weed control. The County could apply to Alberta Environment for such a permit.

b) Is it possible to add limestone as per Half Moon Lake?

Alberta Environment noted that Half Moon Lake was a pilot project and that until all the research was complete, no additional lakes were to be treated.

c) Is there anything that can be done?

Alberta Environment indicated that it is both a natural situation and the result of excessive nutrients in the lake. Increased water levels, reduced nutrient loading, harvesting of shoreline weeds and improved water quality will help reduce the problem.

4) Poor Water Quality

a) Can cattle be prevented from having direct access to the lakes?

It was noted that cattle from the surrounding farms have direct access to the lakes in both winter and summer. Alberta Environment stated that the cattle have the potential to add a substantial amount of effluent to the lake, but this has not been measured or investigated on Mann Lakes.

There is no legislation which prohibits cattle from using a lake. The local health unit can restrict cattle if serious water contamination occurs. Fish and Wildlife Division can prevent access to protect fish or wildlife habitats. The County will review their By-law to determine if Council has any authority.

ISSUES OF MODERATE CONCERN

1. Overdevelopment

a) Can the County prohibit further development?

The County may restrict further subdivisions but can continue to issue building permits for existing vacant registered lots. The final plan will not prohibit lot owners from building on their land providing the proposal conforms to the provisions of the Land Use Bylaw.

b) Will Crown Land be protected in the plan?

Crown Land is administered by Alberta Public Lands and they can lease or sell the property. Development, however, shall be in accordance with the County Bylaw. The Background Study recommends that Crown Land be protected from further development. The County Council, however, is responsible for adopting such a proposal.

2. Fishing/Wildlife

a) Can the lakes be stocked with fish?

Both lakes have been stocked with fish but heavy fishing and winterkill have kept populations low.

Restocking the Mann Lakes is currently part of a long range plan by Alberta Fish and Wildlife Division, Alberta Forestry Lands and Wildlife. However, the residents should petition the County to lobby Fish and Wildlife to include the Mann Lakes for immediate restocking.

b) Can ice fishing be prohibited?

Both lakes are heavily fished during the winter. The only method to prohibit fishing is to have the lakes declared as a protected area. The County could lobby Alberta Forestry, Lands and Wildlife to institute such a ban.

After discussing the issues and concerns, the process involved in preparing the Mann Lakes Area Structure Plan was outlined. It was noted that prior to any final adoption, a public hearing would be held. Residents would be notified of the time, date and place.

8.0 APPENDICES

APPENDIX A

UPPER/LOWER MANN LAKES
LAND USE SURVEY

TOTAL SENT 348
TOTAL RESPONDENTS 236

1. Which term best describes how you use your property at Upper/Lower Mann Lake?

A) Permanent resident	33 (15%)	
B) Seasonal resident	201 (85%)	2 No Response

2. Which term best describes your property?

A) Residential lot with Dwelling	155 (71%)	
B) Vacant Residential Lot	58 (7%)	
C) Farmland	7 (3%)	
D) Institutional	1	
E) Commercial	-	4 No Response

3. What type of accomodation do you use at the lake?

A) House/Cottage	160 (68%)	
B) Mobile Home	18 (7%)	
C) Moveable trailer (RV)	36 (15%)	
D) Other (please Specify)_____	17 (7%)	5 No Response

4. What type of waste disposal system do you use?

A) Pit toilet	143 (61%)	
B) Pump out tank	38 (16%)	
C) Septic Field	28 (12%)	
D) Chemical toilet	5 (2%)	
E) Other _____	14 (6%)	8 No Response

5. If you are a seasonal resident, why did you choose this lake? Please identify the two most important reasons.

A) Friends or relatives	64 (27%)	
B) Good fishing	51 (21%)	
C) Close to good highway	33 (13%)	
D) Clean lake water	11 (4%)	
E) Close to home	13 (5%)	
F) Natural Beauty of the lake	27 (11%)	
G) Good boating	1	
H) Availability of lots	9 (4%)	
I) Other _____	6 (2%)	22 No Response

6. In your opinion is each of the following a problem?

	YES	NO	
A) Algae growth	211 (90%)	9 (4%)	16 No Response
B) Weed growth in lake	198 (84%)	20 (8%)	17 No Response
C) Fluctuating water levels	188 (80%)	26 (11%)	22 No Response
D) Poor fishing	86 (36%)	98 (42%)	52 No Response
E) Water is dirty or polluted	116 (50%)	72 (38%)	48 No Response
F) Shoreline weeds	177 (75%)	32 (13%)	27 No Response
G) Beach areas often overcrowded	16 (7%)	156 (66%)	64 No Response
H) Lake itself often overcrowded	22 (11%)	157 (67%)	57 No Response

7. How would you rate the water quality of Upper/Lower Mann Lakes?

A) Excellent	4 (2%)	7 No Response
B) Good	40 (17%)	
C) Fair	96 (41%)	
D) Poor	89 (38%)	

8. Do you think the water quality is:

A) Getting better	2	
B) About the same	42 (18%)	
C) Getting worse	125 (53%)	
D) Varies over time	46 (20%)	
E) Don't Know	16 (7%)	5 No Response

9. What is your opinion of the following: on Upper/Lower Mann Lake.

1) Beach Areas

Please Explain — No Problem - 80 (34%)

Expand/Improve 25 (11%) — Too Weedy 21 (9%)

Poorly Maintained 18 (8%) — Overcrowded 15 (6%) — 71 No Response

2) Park Areas

Please Explain — No Problem - 105 (45%)

Expand/Improve 24 (10%) — Overcrowded 12 (5%) — 84 No Response

3) Cottage Areas

Please Explain — No Problem - 131 (56%)

Improve Facilities 10 (4%)

Overdeveloped 23 (10%) — 70 No Response

10. Do you utilize your property during the winter?

A) YES 126 (54%) B) NO 102 (43%) 6 No Response

11. Do you use a boat at Upper/Lower Mann Lake?

A) YES 200 (85%) B) NO 34 (15%) 2 No Response

12. Do you believe there is a need for more public boat launches on the Lake?

A) YES 49 (21%) B) NO 177 (75%) 10 No Response

13. Do you feel that boating use on the lake should be:

A) Unrestricted	78 (33%)	
B) Zoned to control speed in certain areas	73 (31%)	
C) Zoned to prohibit all or some types of boating in certain areas	47 (20%)	
D) Don't know	31 (13%)	7 No Response

If you feel boating restrictions are required, please indicate the location best suited: _____

No Response

14. Are you aware of any lake use conflicts (boaters, gas stations, fisherman) on the lake?

YES 31 (13%) NO 190 (81%) 15 No Response

If yes please describe the conflicts and identify a specific location

No Response

15. Do you believe that additional cottage development is desirable or appropriate for Upper/Lower Mann Lakes:

YES 50 (21%) NO 165 (70%) 21 No Response

Please explain _____

16. Do you believe that commercial retail services (stores, gas stations, etc.) are desirable or appropriate at the Lake?

YES 37 (16%) NO 194 (82%) 5 No Response

Please explain _____

17. Do you believe that additional campground or park development is desirable or appropriate for the lake?

YES 30 (17%) NO 184 (78%) 13 No Response
Please explain _____

18. Would you welcome commercial campgrounds and/or private resorts around the Lake?

YES 36 (15%) NO 191 (81%) 9 No Response
Please explain _____

19. The Upper/Lower Mann Lake area contains much Crown Land. Would you welcome development of this land?

YES 43 (18%) NO 177 (75%) 16 No Response
Please explain _____

20. What issues/concerns would you like the County of St. Paul to address over the next few years with respect to Upper/Lower Mann Lakes?

1)	Water Levels	21%
2)	Poor Municipal Services/taxes	14%
3)	Weeds/algae	13%
4)	Poor Water Quality	11%
5)	Overdeveloped	9%
6)	Fishing/Wildlife	9%
7)	Destroyed Shoreline	5%
8)	Lake Access	5%
9)	Improve/Expand Facilities	5%

No Response 8%

APPENDIX B

USER STATISTICS

1. Residential Subdivisions
   Total number of registered lots = 485
   Total number of developed lots = 226

   (assuming weekend use is 3.3 persons/dwelling)
   The average number of users during peak occupancy would be:
   3.3 x 485 = 1600 potential users
   3.3 x 226 = 746 users

2. Recreation Area (Lower Mann)
   Average daily weekend use (July 1988)
   day users = 85
   overnight campers = 133

3. Use Densities

   3.1 Present Use levels/weekend:
   - residential users; 746
   - recreation users; 85 + 133 = 218
   TOTAL = 964 USERS

   3.2 Potential Use Levels:
   - residential users; 1600
   - recreation users; 323 (assuming 3.4 persons for each of the 70 sites available + 85 day users)
   TOTAL = 1823 POTENTIAL USERS

4. Land Use

   Total Surface Area (Upper and Lower) = 1212 ha
   Total Residential = 226 (developed lots)
   Total Recreation Parties = 70 (Day use and Campsites)
   TOTAL USE = 896 (RESIDENTIAL AND RECREATION UNITS)

   Therefore each unit would have approximately 4 ha of lake surface available for recreational use.

   At total developed/use capacity, each unit would have approximately 2 ha of lake surface available for recreational use.

Based on these figures the lakes are at their full capacity as future development occurs the recreational enjoyment of the lakes will deteriorate accordingly.

APPENDIX C

BOAT USE

To estimate the number of boats on the Mann Lakes the following assumptions were made from analysis of the property owner survey, field research and information supplied by the County of St. Paul.

a) The landowner survey indicated that 85% of the respondents owned and operated a boat on the Mann Lakes. The total number of boats owned by the residents is therefore estimated at (85% of the 226 developed lots) 192.

b) It is assumed by Alberta Recreation and Parks that 25% of the day use/camping parties at the recreation area will operate a boat. In this case, with 70 lake user sites approximately 8 will operate a boat.

c) Total potential boat use should all registered lots be developed: Upper 245 boats, Lower 167 boats, (85% of 485 total registered lots).

d) It is assumed that most of the boats on the Mann Lakes will be motor boats. Field research and input from the Planning Committee and Alberta Recreation and Parks indicated that other types of boats (i.e. sailboats, canoes, etc.) are rarely used.

Considering the available lake surface to be 475 ha for Upper Mann and 410 ha for Lower Mann, each boat assigned to existing developed residential lots has approximately 3.8 ha for Upper and 4.9 ha for Lower of lake surface area. This figure changes dramatically when the number of potential boats from the unsubdivided lots are added. Approximately 1.9 ha for Upper and 2.2 ha for Lower of lake surface would be available. Considering a 20% utilization level, the Lakes would be hard pressed to accommodate additional boating use.

e) Potential Boat Use
- Registered subdivision lots = 485 lots
- Potential boats - 85% = 412 boats
- Potential Cabins/Campsites = 70
  Potential boats = 70 x .25 = 18 boats

Total Potential Use = Upper Mann 245 boats
Lower Mann 183 boats

Total Lake surface area available for futurs boating (including recreation area) = Upper Mann 1.9 ha
Lower Mann 2.2 ha

APPENDIX D

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